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1952 TECHNICAL SERVICE MANUAL

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for the

1952 "AMBASSADOR" "STATESMAN" and "RAMBLER" SERIES

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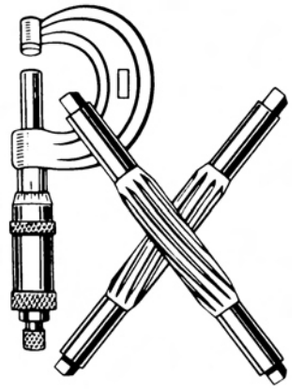
Nash Motors

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TECHNICAL SERVICE MANUAL



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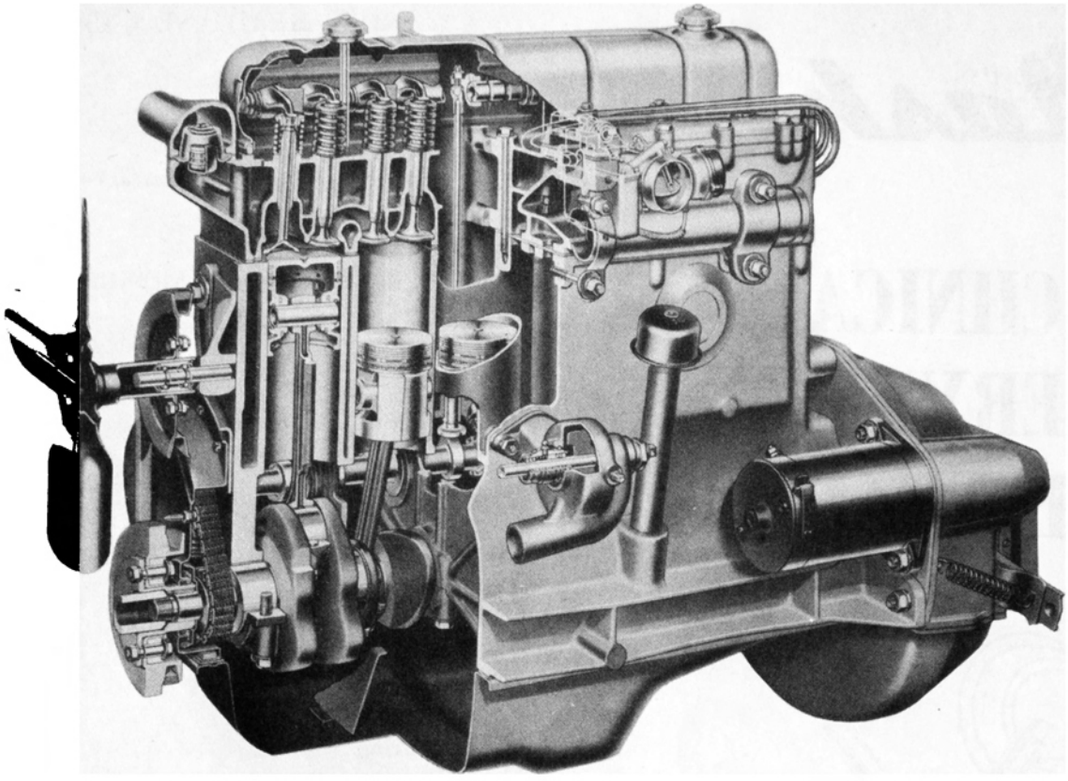
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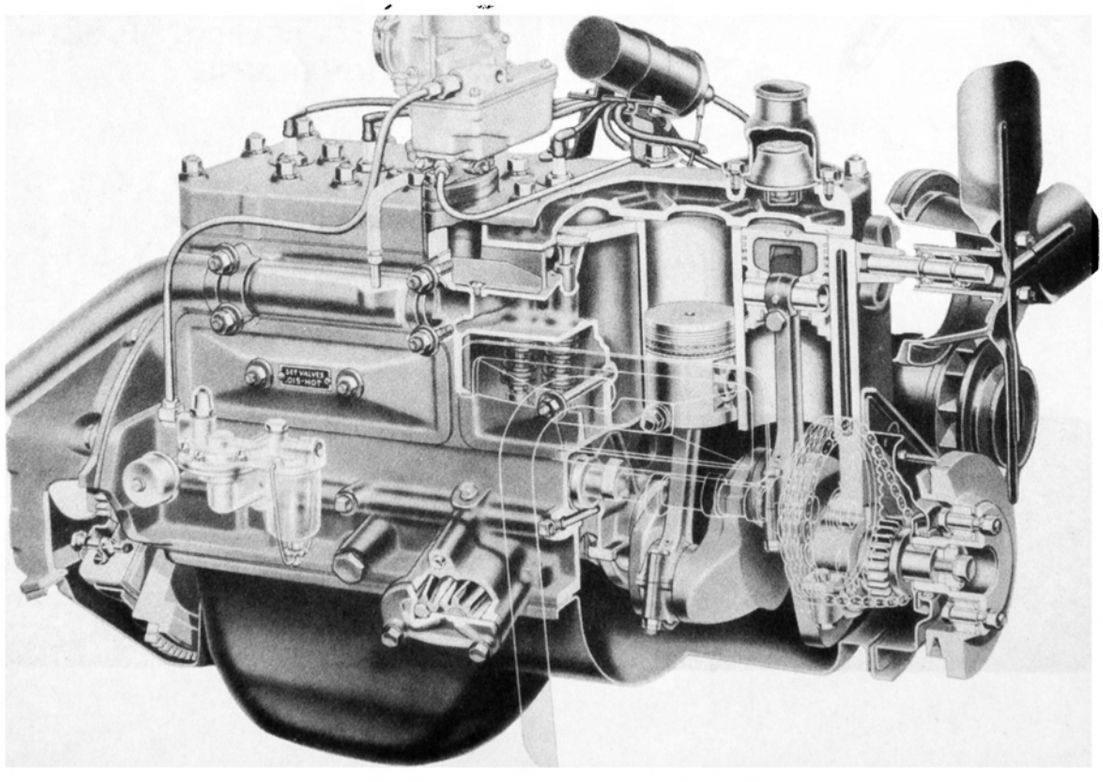
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ENGINE

ENGINE SECTION



"Ambassador" Series Engine Assembly



"Statesman" Series Engine Assembly

ENGINE IDENTIFICATION

"Ambassador" Series

On this series, the engine number is located on the upper right hand corner of the engine block.

"Statesman" and "Rambler" Series

The engine number is stamped on a machined surface located on the right side of the engine block just above the exhaust pipe.

Letter Identification, Size of Bore, Main Bearings, and Connecting Rod Bearings

In the machining of cylinder blocks and crankshafts, it is sometimes necessary to machine the cylinder bores to .010″ oversize, and the crankshaft main bearing journals or crank pins to .010″ undersize.

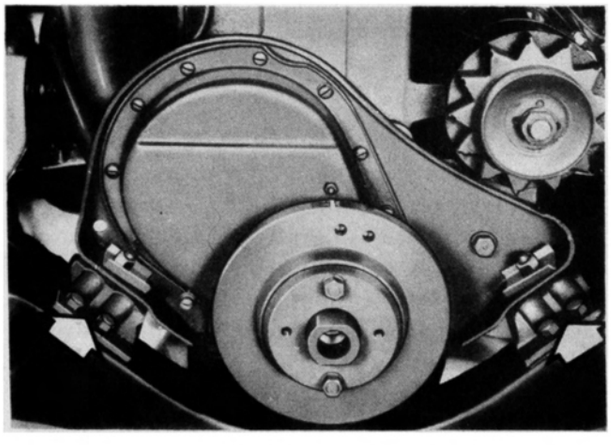
These engines are marked with a three letter code. The code is stamped adjacent to the engine number. The letters are decoded as follows:

First Letter	Size of the Bore
Second Letter	Size of the Main Bearings
Third Letter	Size of the Connecting Rod Bearings
Letter "A"	Standard
Letter "B"	.010″ Undersize
Letter "C"	.010″ Oversize

Engines that are not marked are standard in all respects.

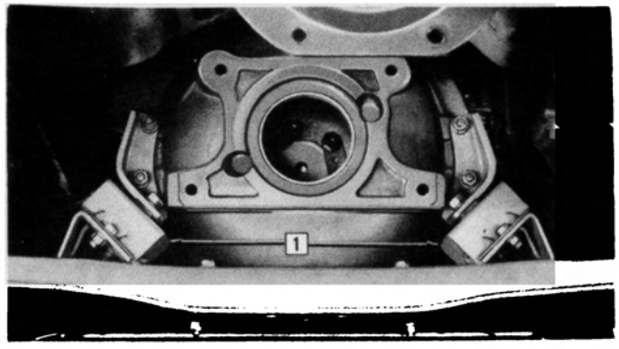
ENGINE MOUNTINGS

Resilient rubber mounts are provided for the engine at four points (Figs. 1, 2, 3, and 4).



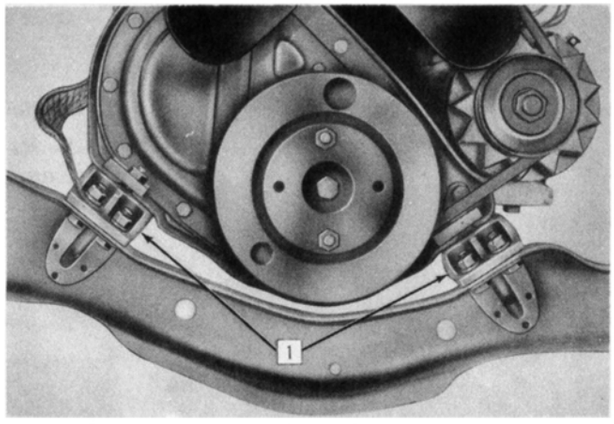
1. Front Support Cushions

FIGURE 1—*Front Mounting "Ambassador" and "Statesman" Series.*



1. Rear Support Cushions

FIGURE 2—*Rear Mounting "Ambassador" Series (Hydra-Matic Shown).*



1. Cushion

FIGURE 3—*Front Engine Mounting "Rambler" Series.*

ENGINE REMOVAL

"Ambassador" and "Statesman" Series

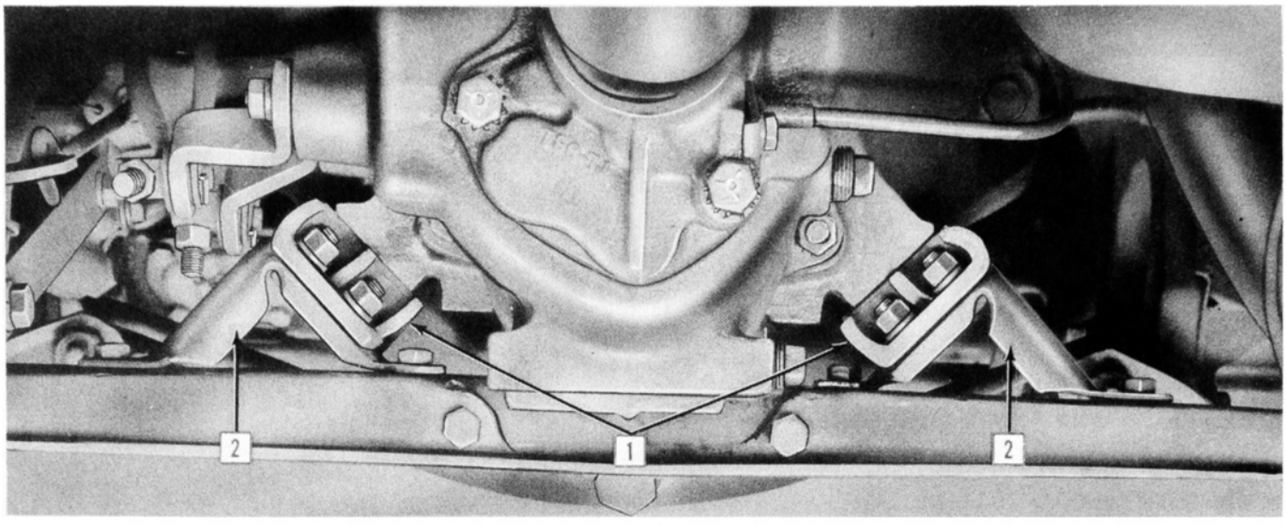
Engine removal on these series is simplified by first removing the front bumper assembly, then the front sheet metal including the radiator core as an assembly (Fig. 5).

The engine assembly, with or without transmission attached, can be removed from its mounting after removal of the "K" brace assembly (Fig. 7).

"Rambler" Series

The engine can readily be removed from below the car. The procedure involves removing the hood top and radiator core. Disconnect the battery cables, generator wires (at generator), ignition switch wire to coil, cylinder head temperature gauge, and oil pressure gauge wires.

Disconnect the gasoline line from the gasoline tank to fuel pump, and fuel pump to carburetor. Then remove the exhaust pipe from the engine and wire it out of the way, upward and clear of the exhaust pipe mounting studs, against the right wheelhouse panel.



1. Cushion 2. Bracket

FIGURE 4—*Rear Engine Mounting "Rambler" Series.*

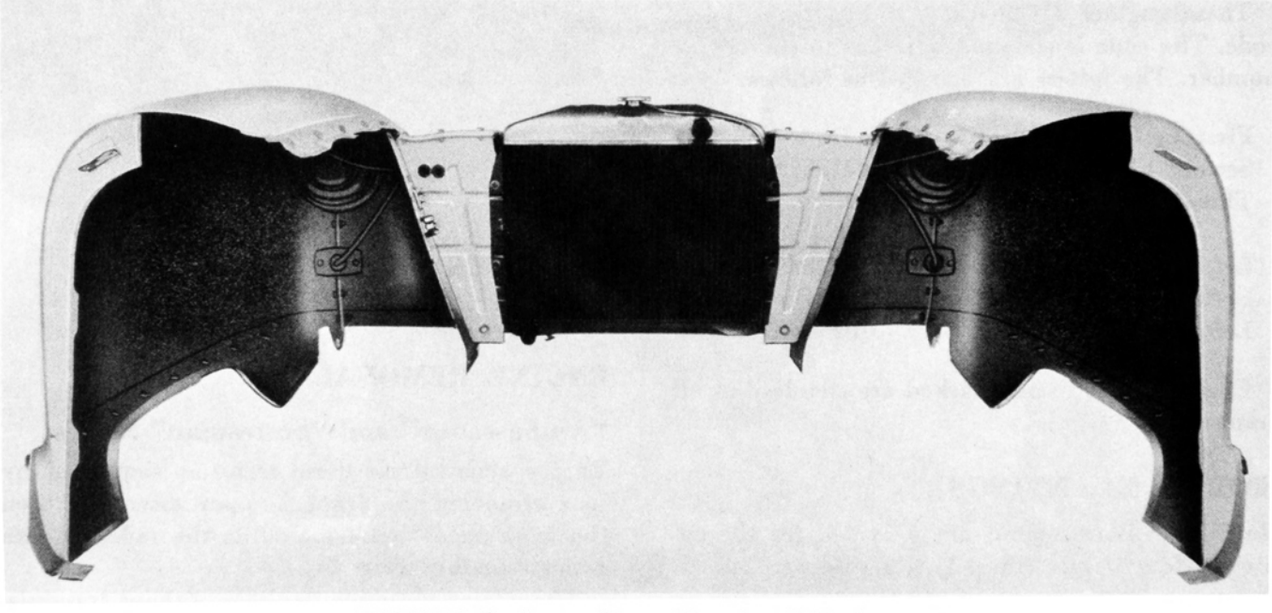


FIGURE 5—*Front Sheet Metal and Radiator Core Assembly Removed as a Unit "Ambassador" Series Shown.*

Attach a lifting fixture to the engine and raise the car preferably on a two post lift. Support the front of the car with the use of high jacks located under the body side sills just behind the rear engine support cross member. Then from below the car, disconnect the cross tie rod from the steering linkage and remove the front suspension lower pivot bar brace. Disconnect the clutch linkage at the clutch beam and the shift rods at the transmission.

Drain the engine oil pan and transmission. Disconnect the speedometer cable at the transmission.

Attach a block and tackle or crane to the lifting fixture and adjust to support the engine weight.

The four bolts holding the front support cross member to the body side sills can now be removed. Then remove the rear engine mounting cross member diagonal braces, and the four bolts that attach the rear engine cross member to the body side sills. The engine will now be supported by the crane or block and tackle. While lowering the engine slightly and to a forward position, the "U" joint can be slipped from the transmission main shaft. The engine can then be lowered completely (Fig. 8).

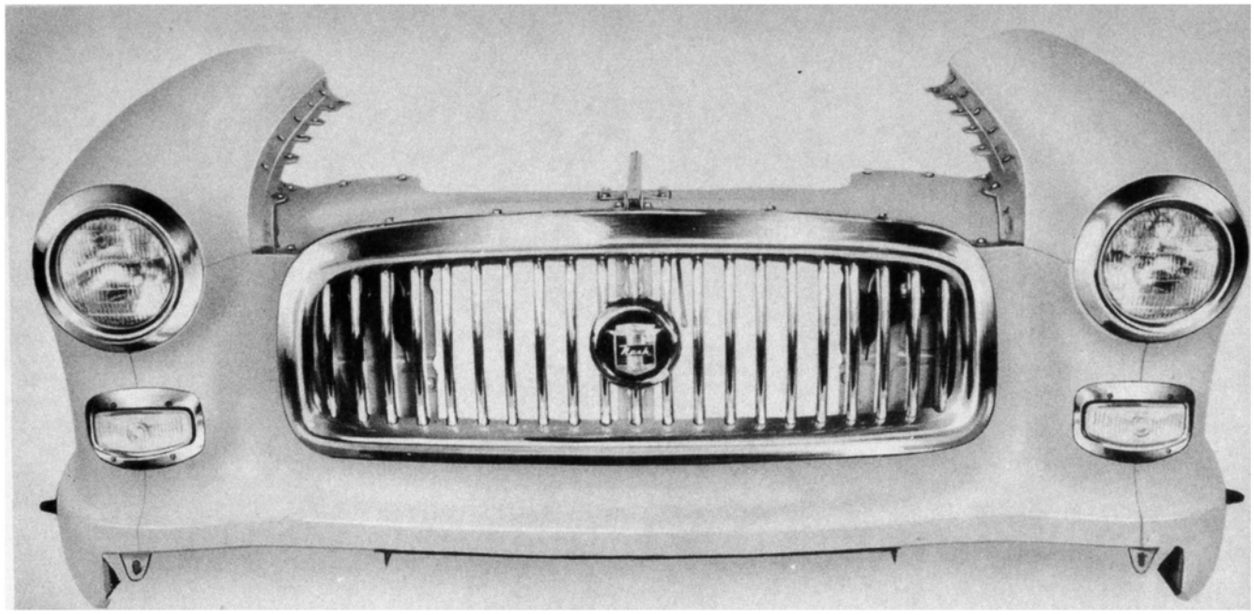


FIGURE 6—*Front Sheet Metal and Radiator Grille Assembly Removed "Ambassador" and "Statesman" Series.*

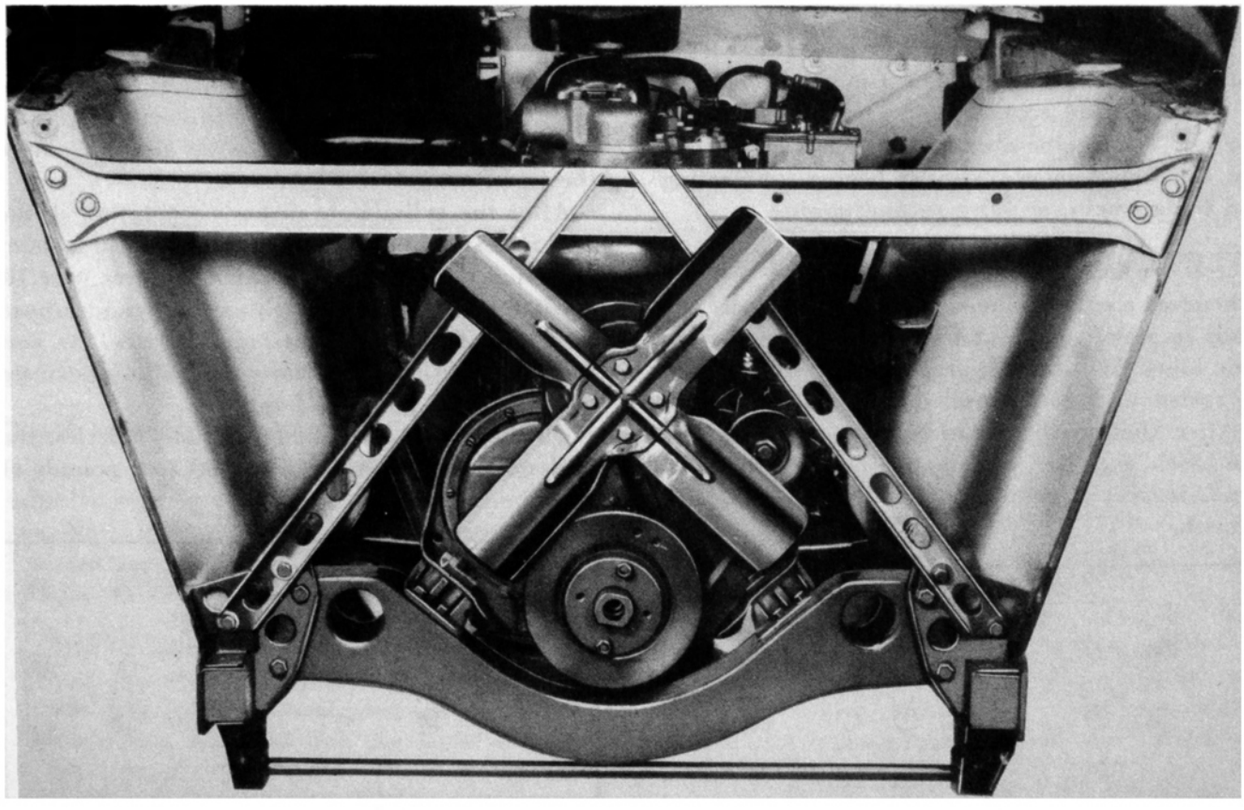


FIGURE 7—*Engine Accessibility After Front Sheet Metal Removal "Ambassador" Series Shown.*

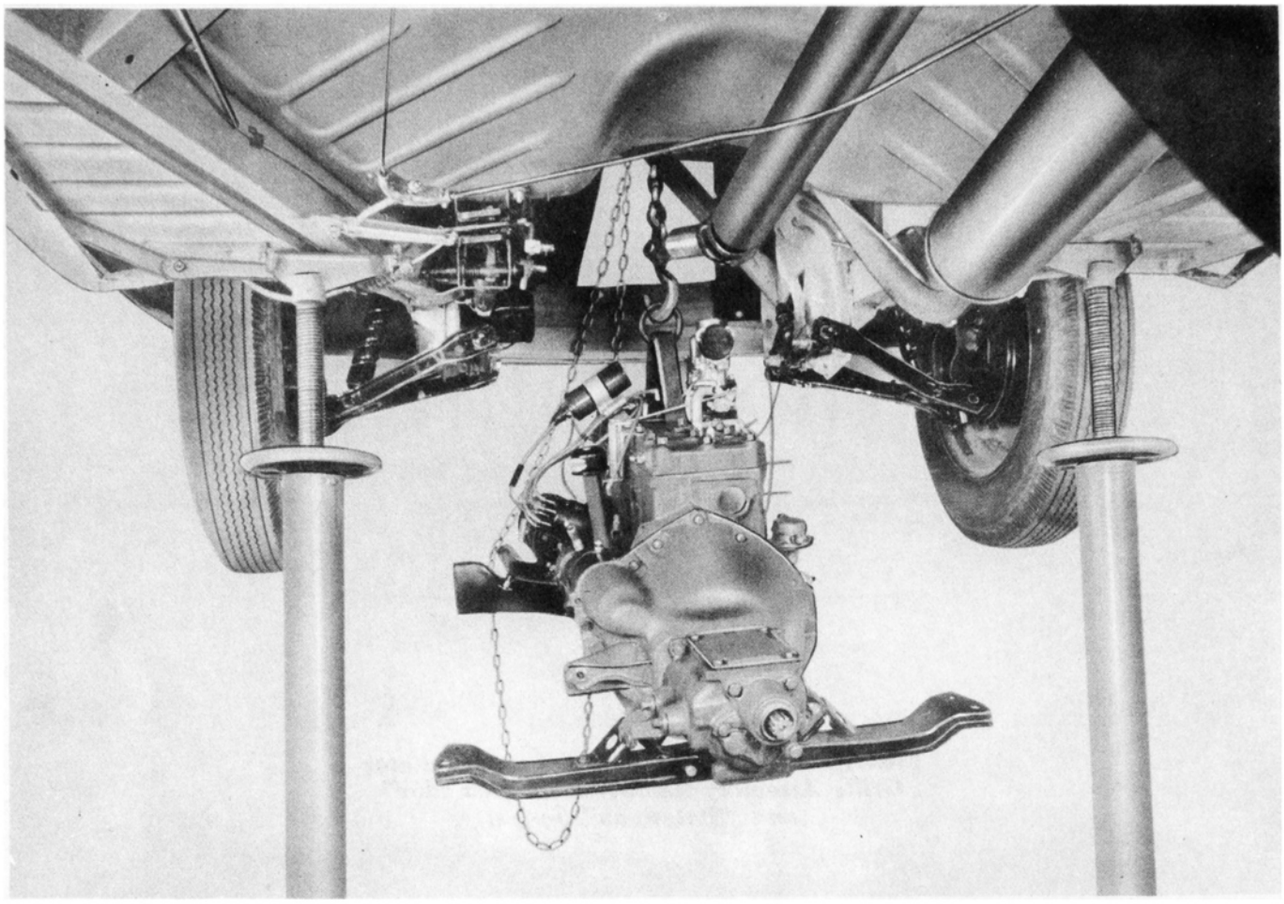


FIGURE 8—*Removing Engine Assembly, "Rambler" Series.*

Whenever a major repair is required which involves removal and replacement of the crankshaft or camshaft, the engine should be removed from the car. The engine need not be removed for piston pin replacement, cylinder boring, connecting rod replacement, or valve reconditioning.

CYLINDER HEAD AND GASKET

Whenever a cylinder head is removed, inspect the studs to make sure that they are tight in the engine block. If the studs are removed, they should be sealed with compound upon replacement.

After thoroughly cleaning the top surface of the block and the bottom surface of the cylinder head, inspect them to see that they are flat and smooth.

Now coat the gasket with "Nash" non-hardening gasket paste and install over the studs. Care should be used when placing the gasket over the studs to see that the threads of the studs do not damage the gasket.

After the cylinder head has been installed, the stud nuts should be tightened in a uniform manner following the sequence shown in Figures 9 or 10. Use a torque wrench to tighten the cylinder head stud nuts. On the "Ambassador" Series, the cast iron cylinder head stud nuts should be drawn up 65 to 70 foot pounds of torque.

On the "Statesman" and "Rambler" Series, the stud nuts are drawn up 57 to 60 foot pounds of torque.

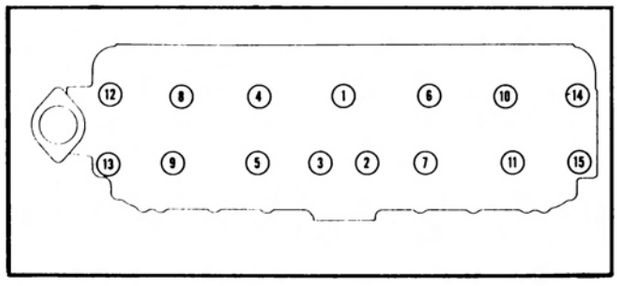


FIGURE 9—*"Ambassador" Series Cast Iron Cylinder Head Stud Nut Tightening Sequence 65 to 70 Foot Pounds.*

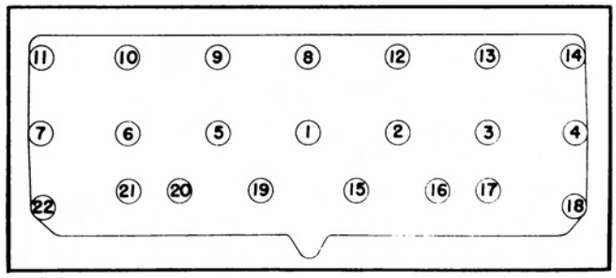


FIGURE 10—*"Statesman" and "Rambler" Series Cylinder Head Stud Nut Tightening Sequence—57 to 60 Foot Pounds Torque.*

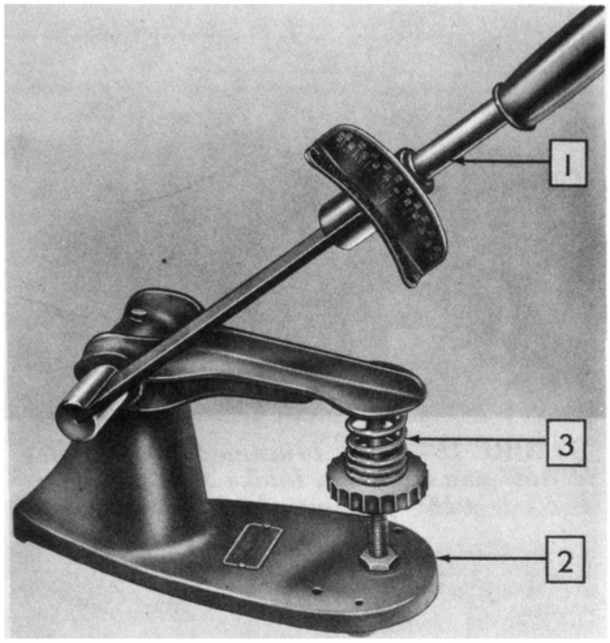
VALVES

Valve Springs

Whenever valve springs are removed, they should be tested according to the specifications listed below using a valve spring tester as shown in Figure 11. Any spring not within the specifications should be replaced.

Valve Spring Specifications

Series	"Ambassador"	"Statesman" and "Rambler"
Valve Spring Approximate Free Height	2 1/16"	2 5/32"
Valve Spring Pressure		
Valve Open	144-154 lbs. @ 1 7/16"	75-82 lbs. @ 1 7/16"
Valve Closed	53-58 lbs. @ 1 13/16"	37-41 lbs. @ 1 3/4"



1. Torque Wrench
2. Valve Spring Tester
3. Valve Spring

FIGURE 11—*Valve Spring Tester.*

"Ambassador" Series

It is not necessary to remove the cylinder head in order to remove a valve spring on this series engine. First remove the spark plug from the cylinder that requires a valve spring replacement and insert a 14 mm. thread size adapter.

NOTE: *This adapter can be made from the body of a spark plug from which the porcelain has been removed, and an air hose connection threaded into the body of the spark plug.*

Maintain air pressure above 90 lbs. in the cylinder while the valve spring is being removed. The air pressure will hold the valve against the valve seat so that the valve lock and the upper retainer can be removed. Use a pry bar and brace as shown in Figure 12, to hold the valve spring down while the parts are removed.

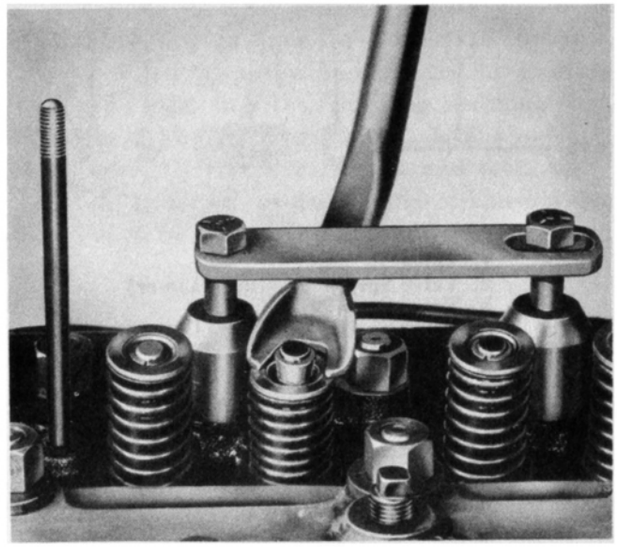
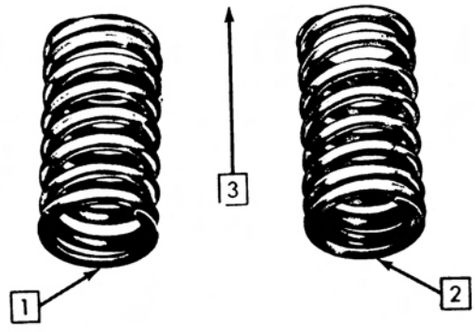


FIGURE 12—*Removing a Valve Spring on the "Ambassador" Series.*

Valve Spring Position "Statesman" and "Rambler" Series

When installing valve springs, it is important that the closely coiled end of the spring should be installed toward the valve seat as shown in Figure 13. This prevents a vibration period from developing at low engine speeds.

CAUTION: *Make sure that the springs are seated in the counterbores of the cylinder block to prevent excessive wear on the valve stems and valve guides.*

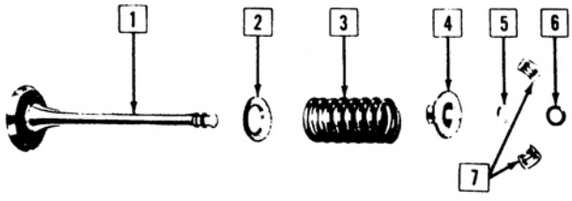


1. Correct Position
2. Incorrect Position
3. Arrow Points to the Valve Seat

FIGURE 13—*Correct position of the Valve Spring "Statesman" and "Rambler" Series.*

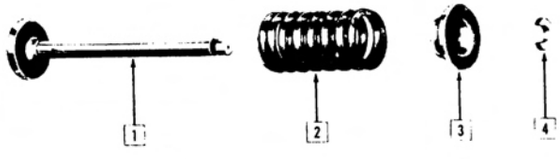
Valve Assembly Sequence

Figures 14 and 15 illustrate the valve assembly sequence.



1. Valve
2. Valve Spring Retainer (Lower)
3. Valve Spring
4. Valve Spring Retainer (Upper)
5. Safety Clip Ring
6. Oil Seal
7. Valve Locks

FIGURE 14—*Valve Assembly Sequence "Ambassador" Series.*



1. Valve
2. Valve Spring
3. Valve Spring Retainer
4. Valve Lock

FIGURE 15—*Valve Assembly Sequence "Statesman" and "Rambler" Series.*

Rocker Arm and Shaft Assembly "Ambassador" Series

The entire rocker arm and valve lubrication is obtained by oil, under pressure from the oil pressure gallery, being directed through the opening provided in the cylinder head, then through the drilled front rocker arm shaft mounting bolt.

CAUTION: *Install the drilled bolt only in the front mounting bolt hole of the rocker arm assembly. The use of any other bolt will prevent the rocker arm assembly from receiving proper lubrication.*

Valve Adjustments

For peak performance and economy, the valve clearance is adjusted with the engine running at normal operating temperature (Figs. 16 and 17).

Valve Refacing

It is important when valves are refaced that just enough metal be ground off to clean up the face. A valve should be replaced after refacing if there would be less than approximately $\frac{1}{32}$" thickness of metal left on the outer diameter of the valve head known as valve margin. A heavy valve margin aids in the dissipation of heat and helps avoid valve warpage (Fig. 18).

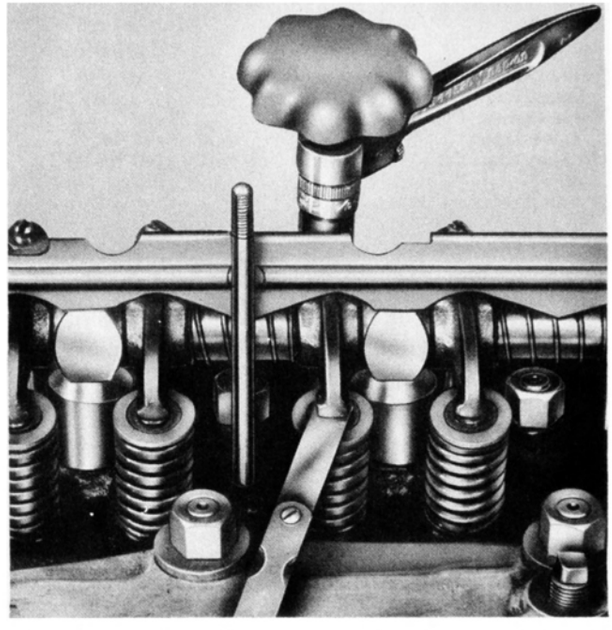


FIGURE 16—*Valve Adjustment, with Engine "Hot" and Running, Intake .012", Exhaust .016" "Ambassador" Series.*

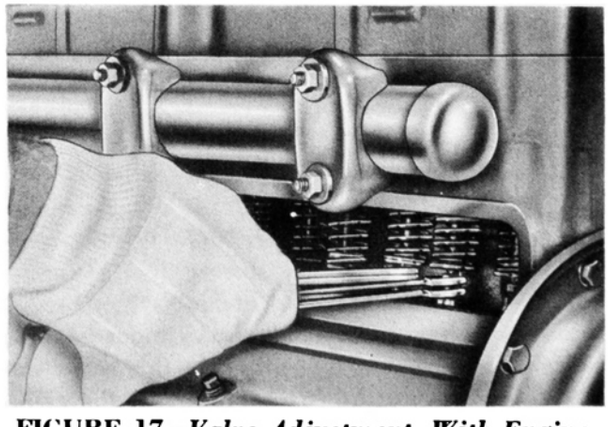
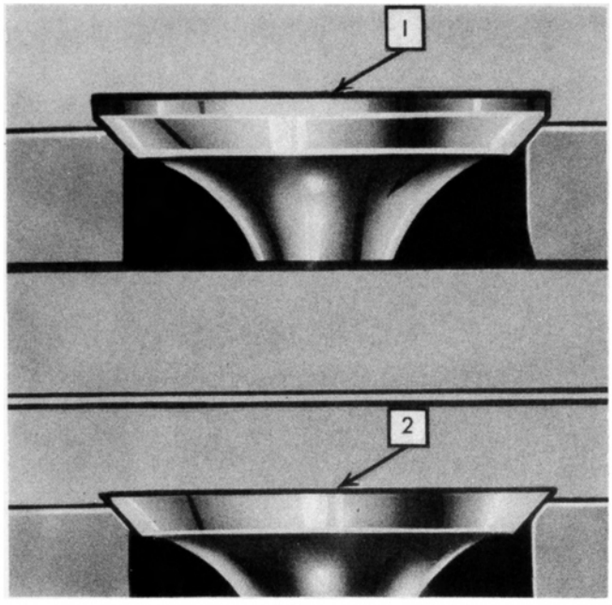


FIGURE 17—*Valve Adjustment, With Engine Hot and Running, .015" Intake and Exhaust, "Statesman" and "Rambler" Series.*

Valve Guide Seal "Ambassador" Series

The "Ambassador" Series valve incorporates a valve stem oil seal installed on the top of the valve guide. This oil seal consists of a felt and neoprene seal assembly, which serves a two-fold purpose. The felt retains oil for initial starting lubrication, while the



1. Correct Valve Refacing
2. Incorrect Valve Refacing

FIGURE 18—*Correct Valve Refacing*

neoprene seal prevents excessive oil passage past the valve stems. Valve guide installing tool J-4687 will facilitate installation of the seal.

Valve Stem to Guide Clearance

The "Ambassador" Series valve stem to guide clearance is .002″ to .004″; "Statesman" and "Rambler" Series .0013″ to .0047″. Replace the guides when these clearances are exceeded. Check valve stem diameters to determine whether or not proper stem to guide clearance will now exist.

Valve stem diameters:

"Ambassador" Series, Intake: .3720″-.3730″
Exhaust: .3725″-.3735″
"Statesman" and "Rambler" Series, .3407″-.3412″

To replace the "Statesman" and "Rambler" Series valve guides, use replacing tool J-1429-A with adapter J-1429-4 for the intake guides. To install the exhaust guide, use tool J-1429-A and drive the guide flush with the guide bore opening in the block (Fig. 19, 20, and 21).

VALVE TIMING

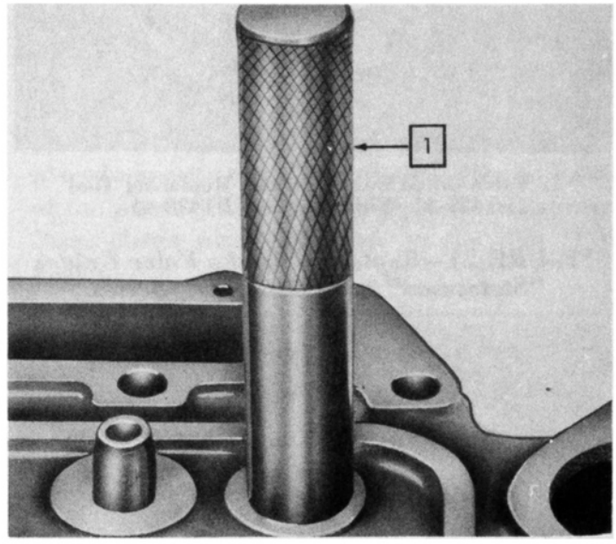
Valve timing is determined by the relation between the sprocket on the camshaft and the sprocket on the crankshaft.

When installing new parts, line up the marked teeth, adjacent to each other, on a center line drawn through the center of the camshaft and the center of the crankshaft (Fig. 22).

Before installing the timing chain cover, check the correct installation of the timing chain; locate the marked tooth of the camshaft sprocket at approximately the one o'clock position. This should place the marked tooth of the crankshaft sprocket where it begins to mesh with the chain (Fig. 23). Count the number of links between the marked teeth of both sprockets. This should be 9½ links or 19 pins. Each link consists of two pins.

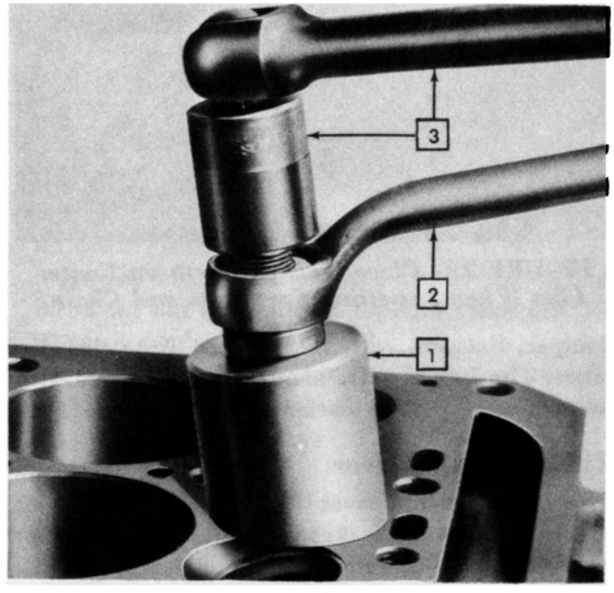
Valve timing may also be inspected by locating the No. 6 piston on T.D.C. in firing position. Then set valves on the No. 1 cylinder to .003″ clearance. Slowly rock the crankshaft back and forth.

If timing is set properly, the exhaust valve should open before the D.C. mark, on the vibration



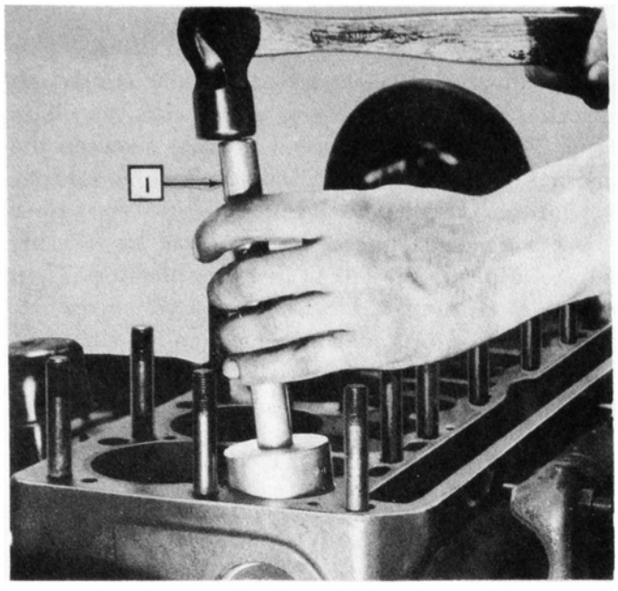
1. Valve Guide Replacing Tool (J-4687)

FIGURE 19—*Replacing Valve Guide "Ambassador" Series Engine.*



1. Valve Guide Removing Tool (J-2814)
2. Box Wrench
3. Socket Wrench

FIGURE 20—*Removing Valve Guides "Statesman" and "Rambler" Series.*



1. Valve Guide Removing and Replacing Tool (J-1429-A) With Adapter (J-1429-4)

FIGURE 21—*Replacing Intake Valve Guides "Statesman" and "Rambler" Series.*

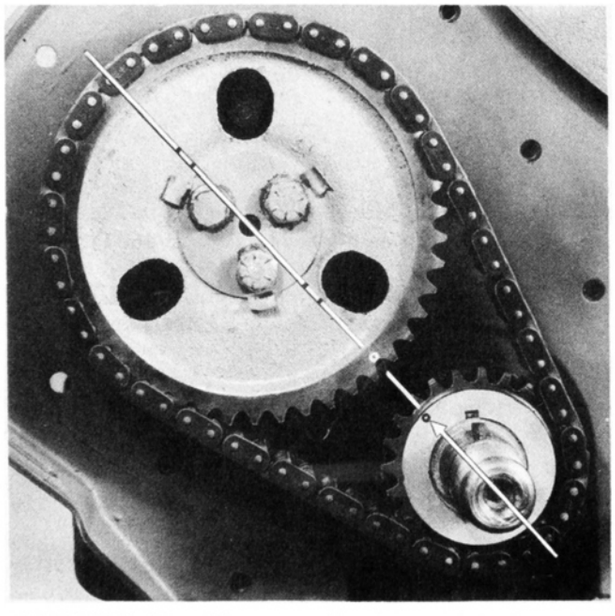
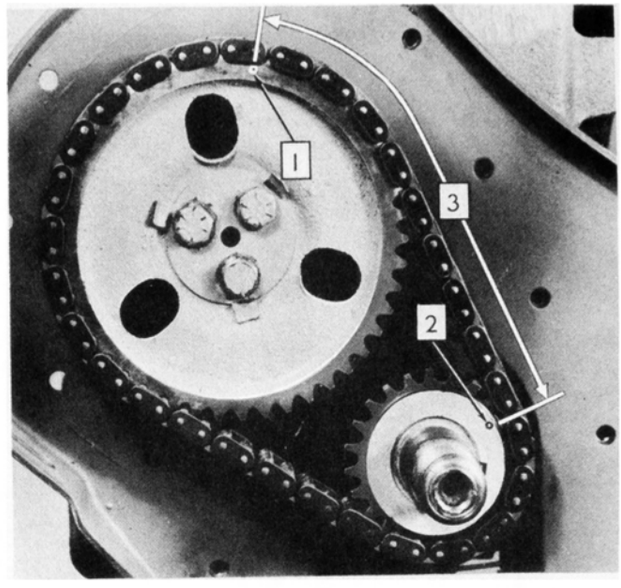


FIGURE 22—*Place Marked Teeth on Center Line When Installing Sprockets and Chain.*

damper, lines up with the pointer. Note this distance. The intake valve should open an equal distance after the D.C. mark passes the pointer.

Timing Chain Cover

The timing chain cover is provided with a felt seal to prevent the leakage of oil around the front crankshaft pulley hub. To prevent damage to this seal, it is important that the cover be properly aligned when installing the vibration damper. This is accomplished by leaving the cover to block screws loose until the vibration damper has been partially installed. Then tighten the cover screws.



1. Marked Tooth on the Camshaft Sprocket
2. Marked Tooth on the Crankshaft Sprocket
3. 9½ Links or 19 Pins

FIGURE 23—*Correct Timing Chain Installation.*

An oil slinger is used inside the timing chain cover. The slinger is held in place by the crankshaft sprocket.

CAMSHAFT AND BEARINGS

The camshaft is supported by four steel shelled, babbitt lined bearings which have been pressed into the block and line-reamed. The camshaft bearings are step-bored, being larger at the front bearing than at the rear, to permit easy removal and installation of the camshaft. All camshaft bearings are lubricated under pressure through drilled galleries in the cylinder block.

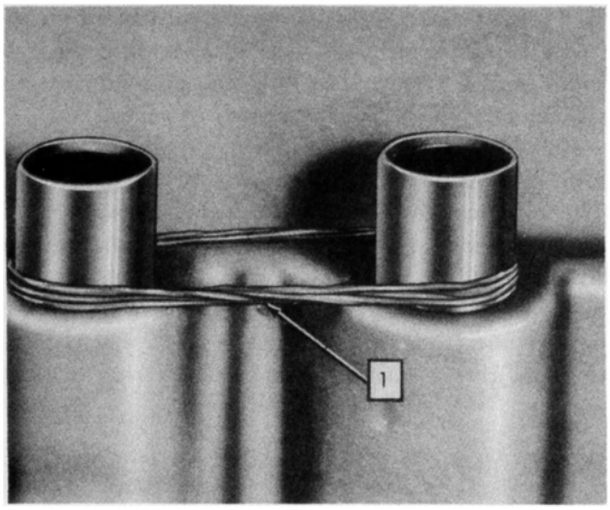
Removing the Camshaft

After removal of the rocker arm assembly, push rods, and engine side plate on the "Ambassador" Series, the valve lifters can be held up away from camshaft as shown (Fig. 24).

To simplify camshaft removal on the "Ambassador" and "Statesman" Series, remove the radiator core and grille assemblies. The front of the engine is then raised slightly.

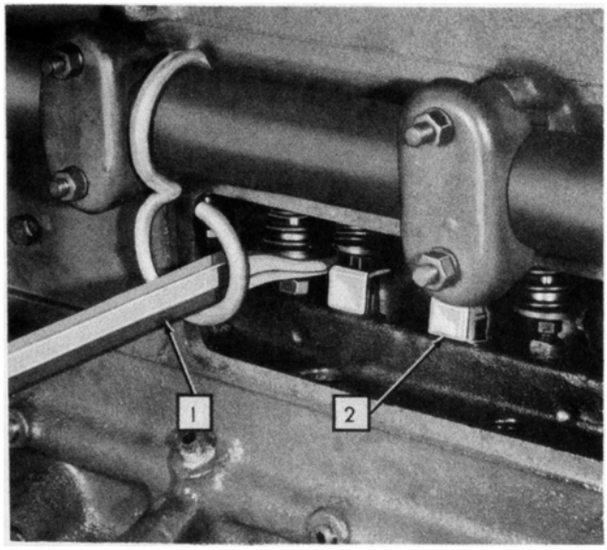
To remove the camshaft on the "Rambler" Series, it is necessary to remove the engine assembly.

The camshaft can be removed from the "Statesman" and "Rambler" Series without removing the valves or the cylinder head by using tool J-1612 with adapters as shown in Figure 25.



1. Rubber Band

FIGURE 24—*Hold the Tappets up with a Rubber Band While the Camshaft is Pulled Out.*



1. Tool J-1612
2. Adapters

FIGURE 25—*Valve Tappet Tool and Adapters.*

Camshaft End Play

The clearance between the camshaft front bearing and the camshaft sprocket should be .004" to .006" on the "Ambassador" Series. On the "Statesman" and "Rambler" Series, this same measurement is taken between the camshaft thrust plate and the camshaft sprocket.

ENGINE OIL PAN

It is necessary to remove the steering linkage cross tie rod and front suspension pivot bar brace to permit removal of the oil pan.

PISTONS

The pistons are cam ground having a .013" larger diameter measured at right angles to the piston pin hole. They contain a steel strut for structural strength. When operating temperature is reached, the piston expands to fit the bore uniformly and provide correct operating clearance at all points.

Upon installation of the piston and connecting rod assemblies, care must be taken to locate them correctly in the engine block. The "Ambassador" and "Statesman" Series pistons are marked with a depression notch on their top perimeter. They must be installed with the notch toward the front of the engine (Fig. 26).

The "Rambler" Series piston pin boss is also offset from the piston center line. When the piston is installed, the heavy side of the piston must be placed opposite the camshaft side. This is the side of the piston which has the greatest measurement from piston pin center line to the side of the piston.

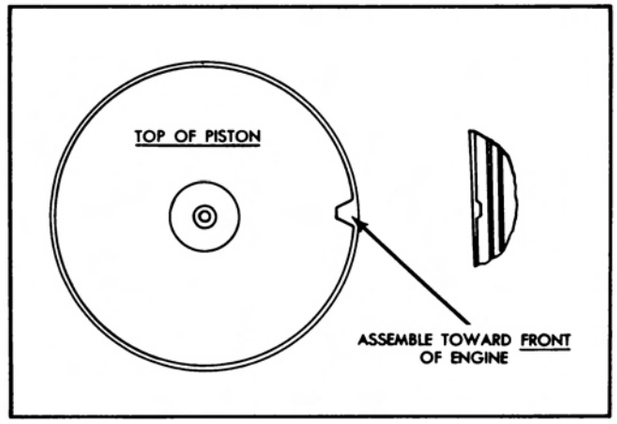


FIGURE 26—*Piston Locations Reference Notch.*

Fitting Pistons

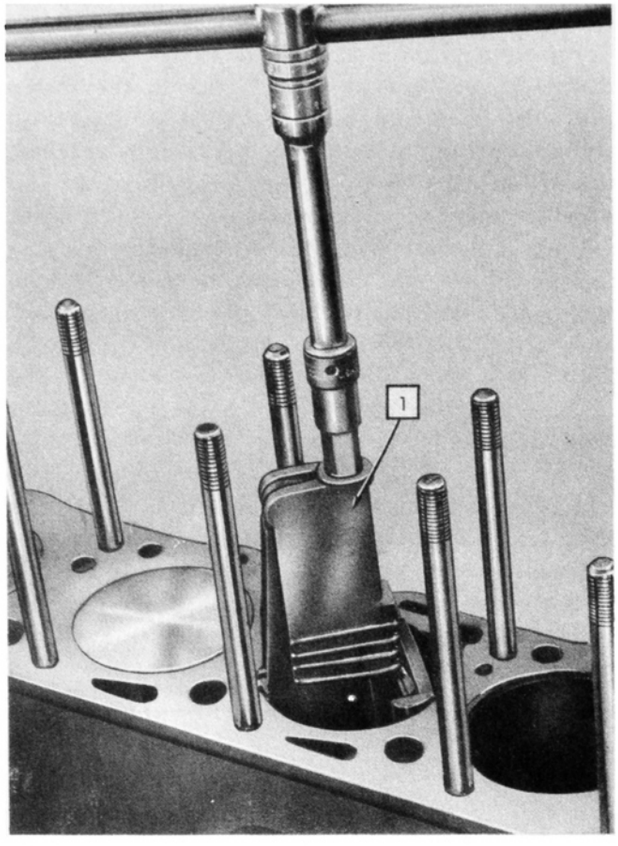
Pistons are fitted so that each piston will support its own weight in any portion of the cylinder with all parts clean and dry.

Before fitting the pistons, check the cylinder bores for out of round or tapered condition. This check is made with a cylinder gauge or dial indicator. If the bore is found to be out of round in excess of .004", it should be trued up by honing (rigid type).

Piston Removal

Piston removal is accomplished from the top of the engine. However, before removing the pistons, the ring ridges in the cylinder bores must be removed (Fig. 27).

Failure to remove the ridge at the top of the cylinder bore will very often result in piston ring breakage and distortion of the piston groove land.



1. Ridge Reamer

FIGURE 27—*Ridge Reaming Before Piston Removal.*

PISTON RINGS

A four ring piston is used in all series engines. There are two compression rings and two oil rings.

	"Ambassador" Series	"Statesman" Series	"Rambler" Series
Top Compression Ring			
Width	.0930"-.0935"	.0930"-.0935"	.0930"-.0935"
Thickness	.165"-.175"	.146"-.156"	.146"-.156"
Gap	.007"-.015"	.010"-.020"	.010"-.020"
Chrome Plate	.004"-.007" Approx.	.004"-.007" Approx.	
Second Compression Ring			
Width	.0930"-.0935"	.0930"-.0935"	.0930"-.0935"
Thickness	.165"-.175"	.146"-.156"	.146"-.156"
Gap	.007"-.014"	.010"-.020"	.010"-.020"
Upper Oil Ring			
Width	.1545"-.1550"	.1545"-.1550"	.1545"-.1550"
Thickness	.157" Max.	.144" Max.	.135"-.145"
Gap	.007"-.017"	.010"-.020"	.010"-.020"
Lower Oil Ring			
Width	.154"-.155"	.154"-.155"	.154"-.155"
Thickness	.143"-.155"	.143"-.155"	.143"-.155"
Free Slot Gaps	.0066"-.0090"	.0058"-.0087"	.0058"-.0087"

NOTE: Ring gap clearance is measured when the ring is at the bottom of its travel in the cylinder bore.

Successful ring installation depends upon cleanliness in handling parts and while honing the cylinder walls. The engine bearings and lubrication system must be protected from abrasives.

Before assembling the rings to the piston, carbon must be cleaned from all ring grooves (Fig. 28). The oil drain holes in the oil ring grooves must also be opened up by a slight ream with the proper size drill. Care must be exercised not to remove metal from the grooves since that will change their depth; nor from the lands, since that will change the ring groove clearance and destroy ring to land seating.

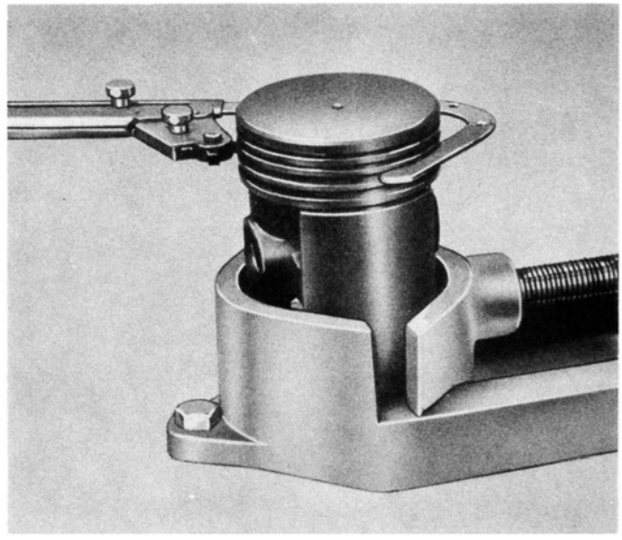


FIGURE 28—*Cleaning Piston Ring Grooves.*

Checking Ring Groove Clearance

Side clearance between land and piston ring should be .002" to .004". Roll the ring around the groove in which it is to operate. It must fit freely at all points (Fig. 29).

Checking Ring Gap Clearance

Piston ring gap or joint clearance is measured in the bottom of the cylinder near the end of the ring travel area. To square the ring in the bore for checking joint clearance, place the ring in the bore. Then, with an inverted piston, push the ring down near the lower end of ring travel area.

When other than standard ring sizes are used, rings should be individually fitted to their respective bores.

If cylinder taper exceeds .009", bore must be trued up and oversize pistons and rings used.

Piston Ring Installation

Prior to ring installation, the upper cylinder ridge must be removed to prevent ring breakage or piston damage (Fig. 27). For quicker ring seating, it is desirable to remove the glaze from the cylinder

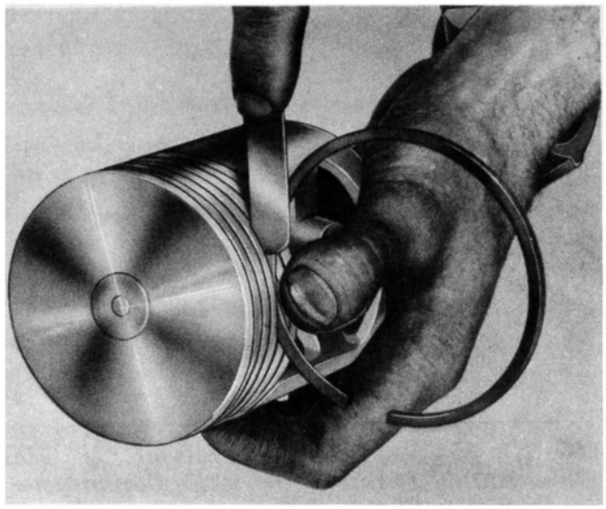


FIGURE 29—*Checking Ring Groove Clearance.*

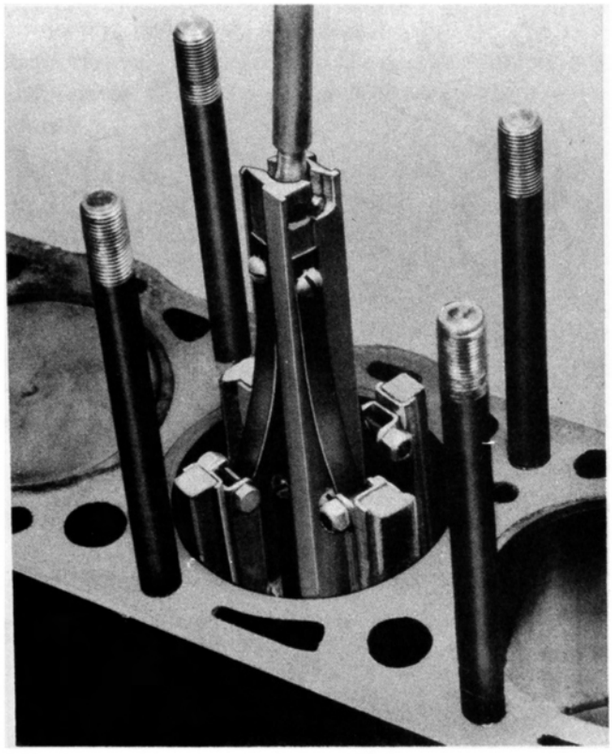


FIGURE 30—*Glaze Removal With Expanding Type Hone.*

wall. This can be done by various methods. If the expanding type hone as shown in Figure 30 is used, do not use more than ten strokes (each stroke down and return) to recondition a cylinder wall.

Rigid type hones are not to be used to remove cylinder glaze as there is always a slight amount of taper in cylinder walls after the engine has been in service.

Rings must be installed on the pistons with a ring installing tool as shown in Figure 31 to prevent distortion and ring breakage.

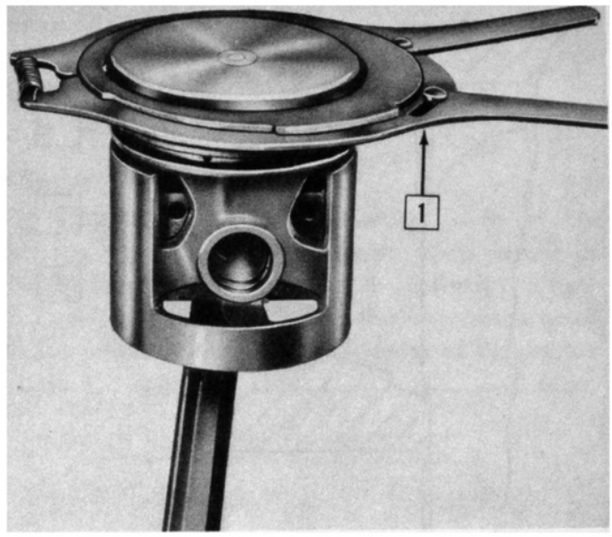
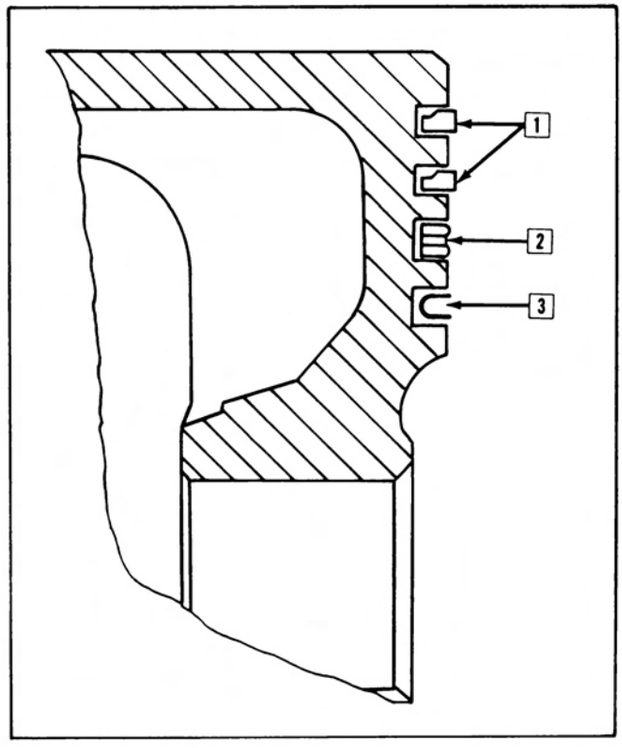


FIGURE 31—*Rings Should be Installed With a Ring Installing Tool.*

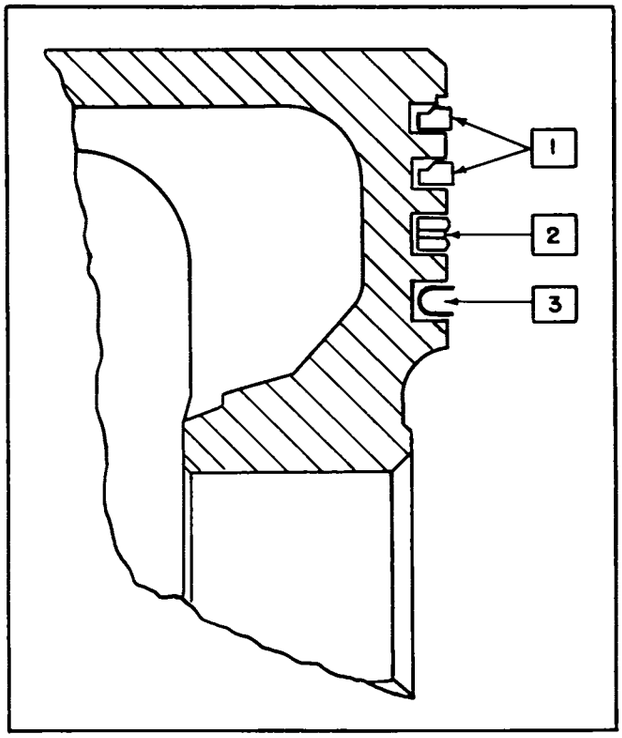


1. Inner Groove Up
2. Oil Control Ring
3. Oil Control Ring "U" Flex

FIGURE 32—*Ring Installation on "Ambassador" Series Piston.*

Figures 32 and 33 illustrate piston ring installation. Be sure to use the designated rings in their respective groove locations with the correct side of the ring toward the top.

All series have a "U" Flex oil control ring installed in the fourth groove.



1. Inner Groove Up
2. Oil Control Ring
3. Oil Control Ring "U" Flex

FIGURE 33—*Ring Installation on "Statesman" and "Rambler" Series Piston.*

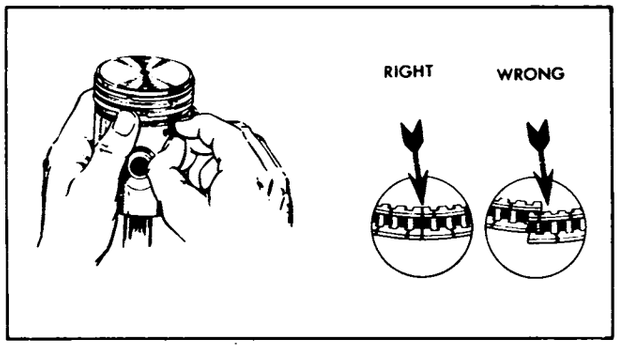


FIGURE 34—*Step 1—Place "U" Flex Ring in Bottom Oil Ring Groove. Lubricate all Rings and Piston Skirt With a Light Grade Engine Oil. Butt Ends of "U" Flex Ring Together.*

In design and construction, the "U" Flex differs from all other rings. The NORMAL FREE diameter of this ring is $\frac{1}{8}$" to $\frac{3}{16}$" larger than the bore diameter in which it is installed.

The ring is completely flexible and maintains its wall pressure by having the ends of the ring tightly butted together. When installed, the gaps between the "U" segment are partially closed resulting in an outward spring action against the cylinder wall.

When installed, according to the instructions given in Figures 34, 35, 36, and 37, the ring will

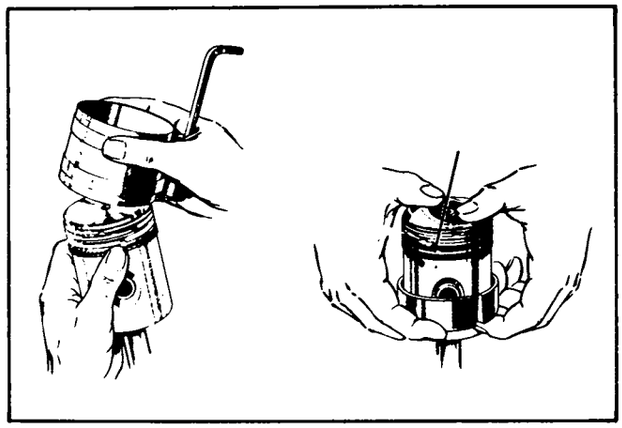


FIGURE 35—*Step 2—Keep Ends of "U" Flex Ring Butted Together and Place Compressor Over the Piston. Either a Constricting BAND or Split Type Sleeve Compressor can be Used.*

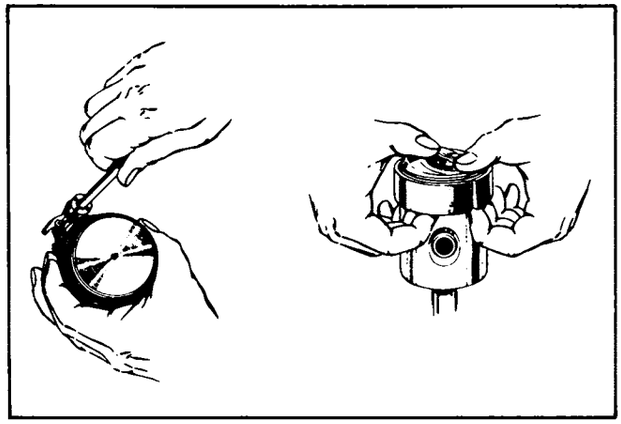


FIGURE 36—*Step 3—Tighten Ring Compressor if Band Type is Used. If Sleeve Type Compressor is Used, BE SURE THAT IT IS NOT PULLED HIGHER THAN THE TOP OF THE PISTON SHAFT. However, it Should be Drawn up High Enough to Cover all of the Rings.*

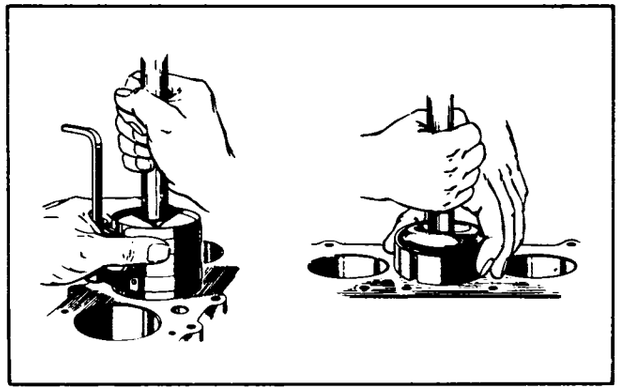


FIGURE 37—*Step 4—Make Sure Compressor Rests Squarely on Top of Block, and Push or Tap Piston into Cylinder. CAUTION: If Piston Does Not Enter Cylinder Without Excessive Force, Remove Piston Assembly and Examine Rings For Ring Interference.*

give the optimum in long life and excellent oil control.

Special Installation Instructions

The design of the "U" Flex oil control ring requires installation that differs from that of other oil rings. When the "U" Flex is compressed into the bore, the two ring ends butt together without any gap between them.

The preceding Figures describe the proper procedure for the installation of the "U" Flex oil control ring.

PISTON PINS

"Ambassador" Series

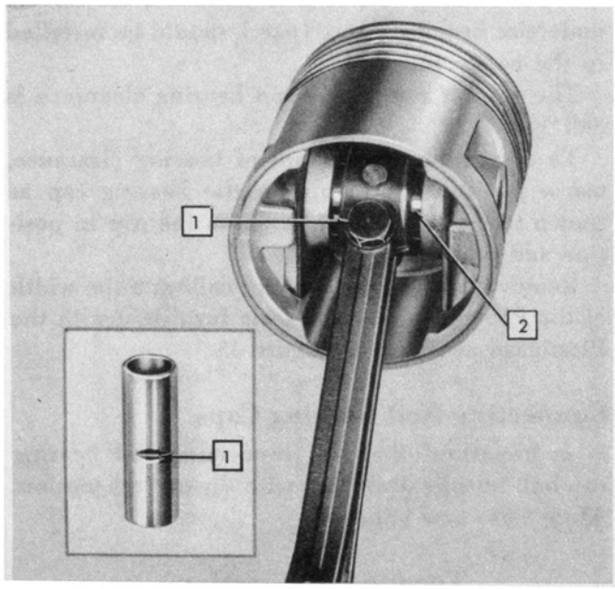
This is a full floating piston pin held in the piston by lock rings. These rings are seated in ring grooves in the outer ends of the piston pin bosses. To fit this pin, first hone the piston pin bushing in the connecting rod to allow a thumb press fit at room temperature (70 degrees). Then hone the piston pin hole to allow a palm push fit with the piston heated.

CAUTION: *Always use new lock rings and be sure that they are seated in the ring grooves.*

"Statesman" and "Rambler" Series

The piston pin is locked in place in the connecting rod by means of a locking bolt (Fig. 38).

To fit this pin, first hone the connecting rod to fit the pin. Then hone the piston to allow a thumb press fit or .0003" maximum loose fit at room temperature (70 degrees).



1. Locking Bolt and Notch 2. Piston Pin

FIGURE 38—*Piston Pin ("Statesman" and "Rambler" Series shown).*

ASSEMBLY OF THE CONNECTING RODS TO THE PISTONS

"Ambassador" Series

When assembling the connecting rods to the pistons, be sure that the identification marks on the connecting rod (Fig. 39) are toward the camshaft side of the engine while the depression notch on the piston top is toward the front of the engine.

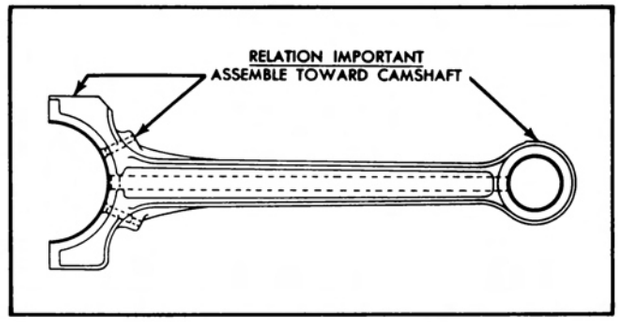


FIGURE 39—*Connecting Rod Identification Marking For Location "Ambassador" Series.*

"Statesman" Series

The identification marks on the connecting rod and the depression notch in the piston must be toward the front of the engine (Fig. 40).

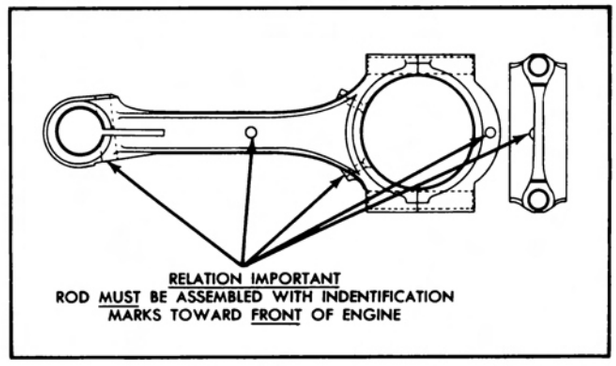


FIGURE 40—*Connecting Rod Identification Marks For Location "Statesman" and "Rambler" Series*

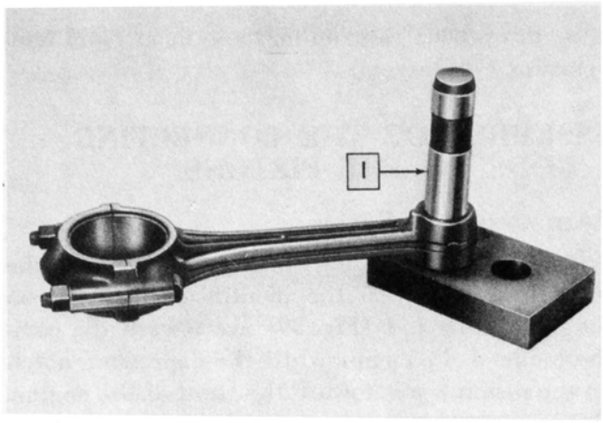
"Rambler" Series

The identification marks on the connecting rod must be to the front of the engine with the heavy side of the piston offset opposite the camshaft.

CONNECTING ROD BUSHING REMOVAL

"Ambassador" Series

To remove the piston pin bushings from the connecting rod, use a connecting rod bushing remover as shown in Figure 41.



1. Connecting Rod Bushing Remover and Replacer (J-1427)

FIGURE 41—*Removing Connecting Rod Bushings "Ambassador" Series.*

CONNECTING RODS

"Ambassador" Series

This connecting rod is rifle drilled to provide lubrication under pressure to the piston pin bushing. There are also two oil holes drilled in the side of the connecting rod for lubrication of the cylinder wall and piston during the engine warm-up period and idle speed operation.

CAUTION: *Under no circumstances should these holes be closed.*

"Statesman" and "Rambler" Series

This connecting rod is not rifle drilled for piston pin lubrication. The pin receives its lubrication through four 1/8" holes drilled from the top in the piston pin boss. Oil supplied by the wiping action of the oil rings drains down through these four holes from the oil control ring grooves.

CAUTION: *Make sure that these oil holes are clean before assembling the piston pin to the piston and connecting rod.*

Connecting Rod Alignment

Whenever new rings are installed or new piston pins are replaced, it is necessary to align the connecting rods and pistons as assemblies to insure true operation in the cylinder bore.

Misaligned rods will cause uneven piston and ring wear which will result in oil consumption. The connecting rod should be inspected for a twisted and a bent condition as shown in Figures 42 and 43.

Connecting Rod Bearings

The connecting rod bearings are the steel backed, babbitt lined precision type. They are installed as pairs in the connecting rod and cap.

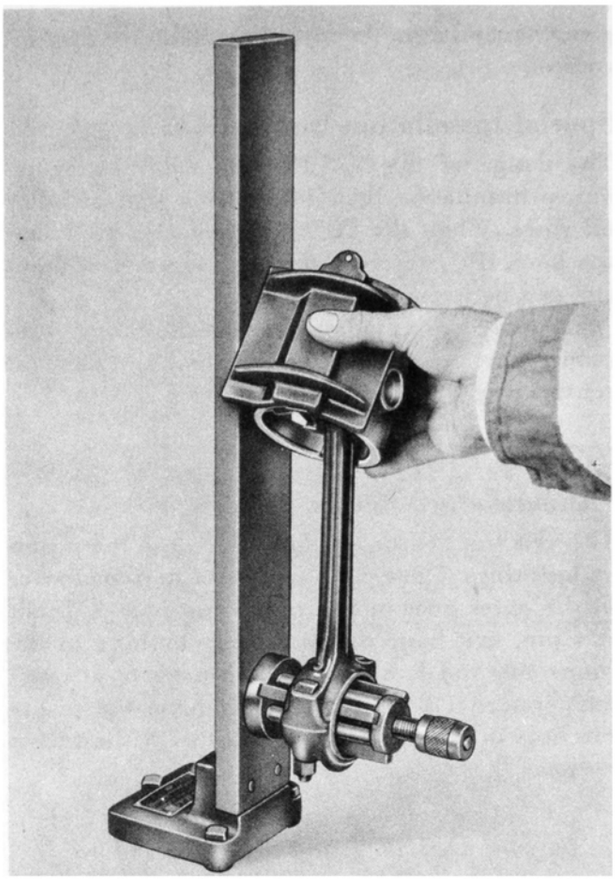


FIGURE 42—*Checking Connecting Rod Alignment for Twist.*

CAUTION: *Never file a connecting rod or cap to adjust bearing clearance.*

If the bearing clearance is excessive, the correct undersize bearing insert (pair) should be installed in the connecting rod.

The correct connecting rod bearing clearance is .001" to .0025".

To determine the amount of bearing clearance, use a piece of Plastigage in the bearing cap as shown in Figure 44. Then tighten the cap in position and compress the gauge.

Remove the bearing cap and calibrate the width of the Plastigage with the scale furnished with the Plastigage as shown in Figure 45.

Connecting Rod Bearing Caps

It is important that the connecting rod bearing cap bolt nuts be drawn up with the correct tension. Always use new pal nuts.

Torque Specifications

"Ambassador" Series – 52 to 56 foot pounds (dry).
"Statesman" and "Rambler" Series–27 to 30 foot pounds (dry).

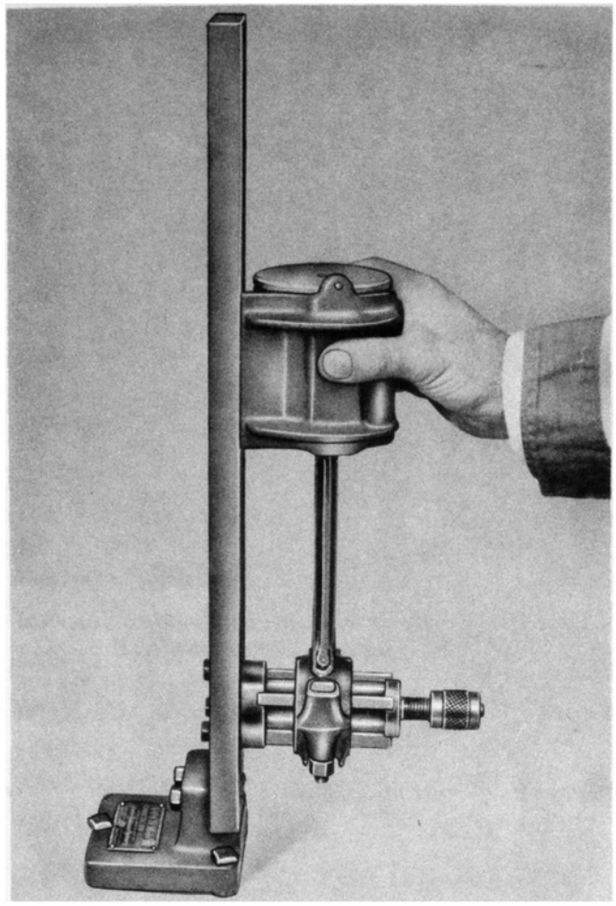


FIGURE 43—*Checking Connecting Rod Alignment for Bend.*

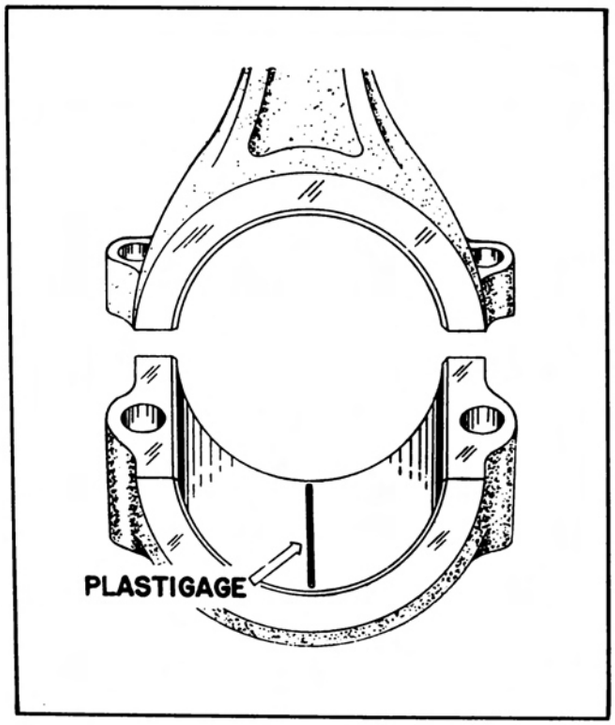


FIGURE 44—*Plastigage in Place in the Bearing Cap.*

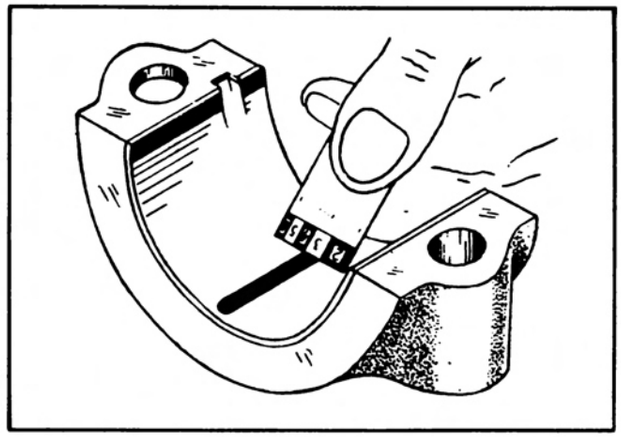


FIGURE 45—*Measure the Width of the Plastigage With the Plastigage Scale.*

CRANKSHAFT

"Ambassador" Series, and "Statesman" Series with Hydra-Matic

Component parts of crankshaft assembly are individually balanced, then the complete assembly is dynamically rebalanced as a unit.

"Statesman" and "Rambler" Series (Standard and Overdrive Transmissions)

The crankshaft is balanced as an assembly with the vibration damper and flywheel. For this reason, caution must be used when replacing the vibration damper or flywheel on the original assembly. Be sure that balance holes are drilled in exactly the same location and to the same depth the original parts were drilled.

Crankshaft Main Bearings

Main bearings are of the precision type having a steel back with a babbitt lining. They should always be serviced in pairs.

Bearings are not adjustable. Shims should never be used and the bearing caps should never be filed.

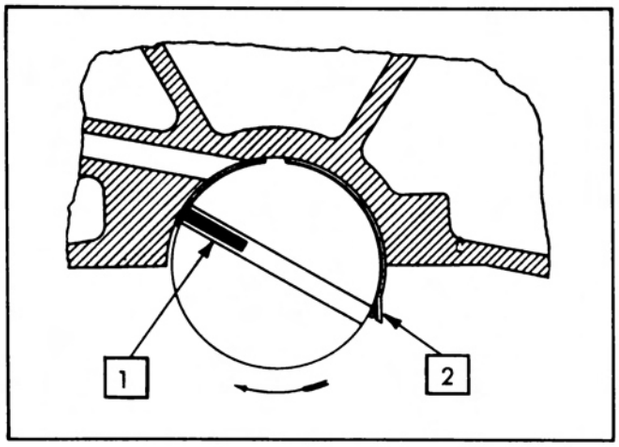
When either half of a bearing requires replacement, a complete set should be installed. To replace the upper half of a bearing, remove the bearing cap of the bearing to be replaced. Then loosen all of the other bearing caps and insert a small pin about ½" long in the crankshaft oil hole. The head of this pin should be large enough so that it will not fall into the oil hole, yet thinner than the thickness of the bearing (Fig. 46).

With the pin in place, rotate the shaft so that the upper half of the bearing will rotate in the direction of the locating tongue on the bearing.

A new bearing crankshaft can be installed by reversing the above procedure.

Crankshaft Main Bearing Clearance

The standard clearance of .002" can be most accurately checked by the use of Nash Plastigage.



1. Removing Tool
2. Bearing Tongue

FIGURE 46—*Removing Main Bearing Insert.*

Remove the bearing cap and wipe the oil from the bearing insert.

NOTE: *When checking bearing clearance, with the engine in such a position that the bearing caps support the weights of the crankshaft and flywheel, keep all main bearings tight except the one being checked.*

Place a piece of Plastigage across the full width of the bearing insert (Fig. 44).

Reinstall the bearing cap and tighten 65 to 70 foot pounds torque (dry). Then remove the bearing cap and, with the graduated scale which is printed on the Plastigage envelope, measure the width of the flattened Plastigage at its widest point (Fig. 45). The number within the graduation indicates the clearance in thousandths of an inch. Install the proper size bearing liners (inserts) to bring the clearance to standard.

Main Bearing Journals

Main bearing journals can be measured without removing the crankshaft from the engine block.

There are various gauges for this use, one of which is shown in Figure 47.

To operate this gauge, remove the main bearing cap and replace the gauge against the crankshaft. Then release the plunger so that it is up against the journal and lock the adjusting screw in position. Remove the gauge carefully and double the micrometer reading to get the shaft diameter.

Always check both ends of the journal to note the taper. Then rotate the shaft 90 degrees and measure for out of round.

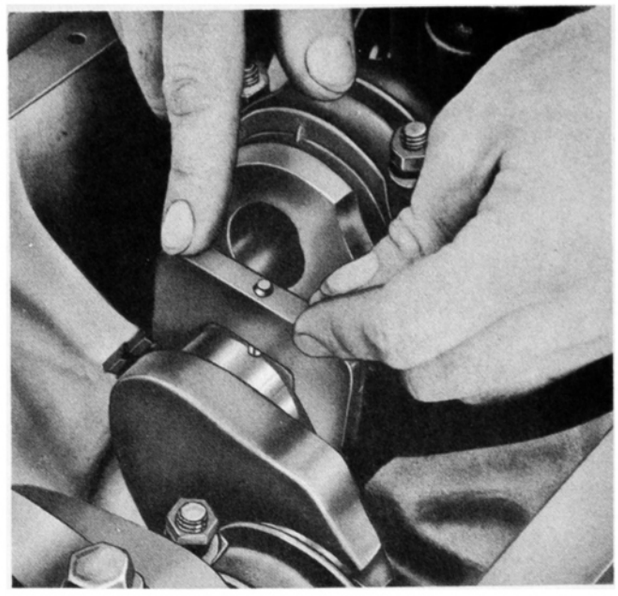


FIGURE 47—*Measuring Main Bearing Journal ("Ambassador" Series Shown).*

Series	No. Main Journals	Diameter
"Ambassador"	7	2.479″
"Statesman" and "Rambler"	4	2.479″
"Ambassador" Crank Pins (Connecting Rod Bearings)		2.000″
"Statesman" and "Rambler" Crank Pins (Connecting Rod Bearings)		2.094″

Main Bearing Caps

Main bearing caps are recessed into the engine block and line-reamed. Therefore, it is not practical to replace them in the field.

Crankshaft End Play

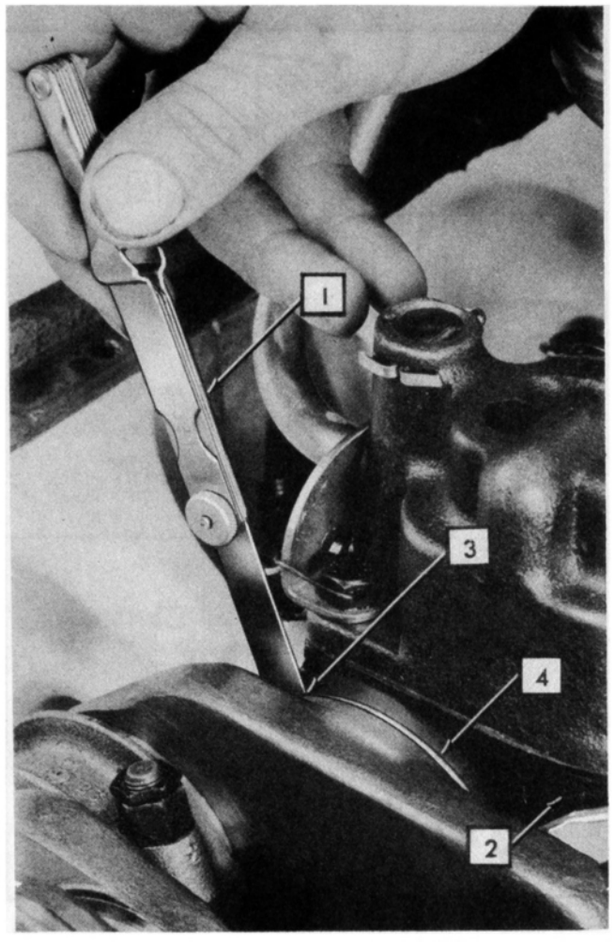
"Ambassador" Series

In this series engine, the crankshaft end thrust is taken at the center main bearing which is flanged for this purpose. The end play should be .006″ to .008″.

To check this clearance, pry the shaft toward the front and check the clearance between the front of the bearing and the shoulder on the shaft (Fig. 48).

"Statesman" and "Rambler" Series

The end thrust is taken on the flanged front bearing and should be .006″ to .008″.



1. Feeler Gauge
2. Center Main Bearing Cap
3. End Play .006" to .008"
4. Front of Bearing

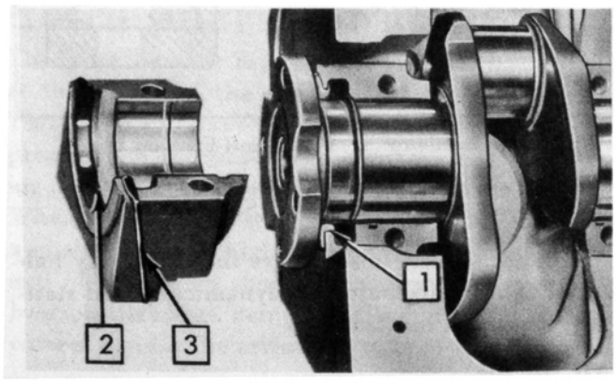
FIGURE 48—*Checking Crankshaft End Thrust "Ambassador" Series.*

REAR MAIN BEARING OIL SEALS

"Ambassador" Series

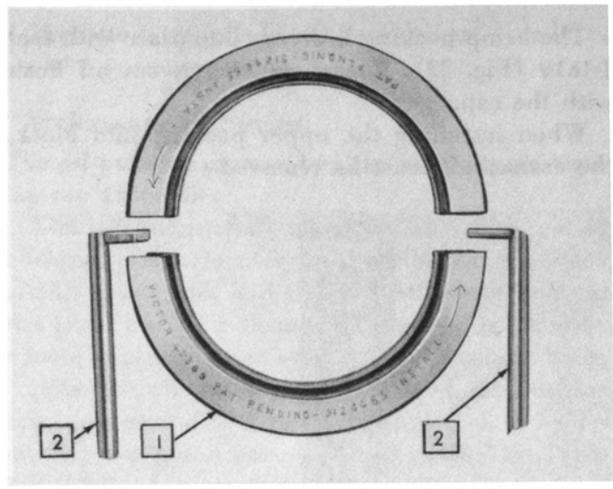
The rear main bearing oil seal is a metal backed neoprene lined seal (Figs. 49 and 50). Apply suitable sealing compound to bearing cap groove and crankcase flange. A slinger on the rear journal provides the means for returning the bulk of the oil emitted from the rear main bearing surface.

The oil seals, upper and lower, are serviced in a manner similar to main bearing inserts and should be serviced in pairs.



1. Upper Seal
2. Lower Seal
3. Side Cap Seal

FIGURE 49—*Rear Main Bearing Oil Seals "Ambassador" Series*

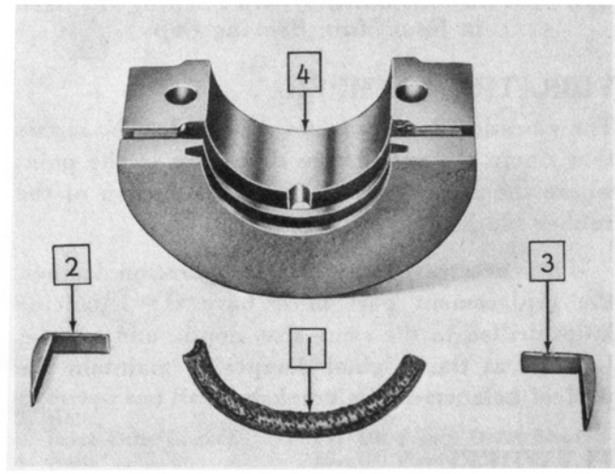


1. Upper and Lower Seal
2. Side Cap Seal

FIGURE 50—*Rear Main Bearing Oil Seals, "Ambassador" Series.*

"Statesman" and "Rambler" Series

The rear main bearing oil seal is composed of two hemp packings: one in the block, the other in the cap. This packing prevents the entrance of dirt and the exit of any oil which may have passed the oil slinger on the rear main journal. Bearing cap and seals are shown in Figure 51.

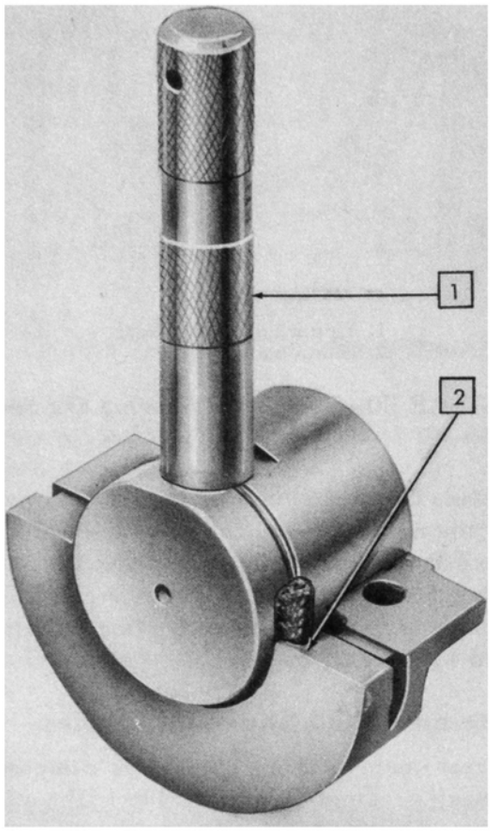


1. Hemp Packing
2. Cap Side Seal
3. Cap Side Seal
4. Main Bearing Cap

FIGURE 51—*Rear Main Bearing Cap and Seals "Statesman" and "Rambler" Series.*

The hemp packing is driven into place with tool J-1610 (Fig. 52). Excess packing is cut off flush with the cap.

When installing the upper packing into block, the crankshaft must be removed.



1. Oil Seal Installing Tool J-1610
2. Point at Which Packing is Cut Flush

FIGURE 52—*Installing Hemp Packing Oil Seal in Rear Main Bearing Cap.*

VIBRATION DAMPER

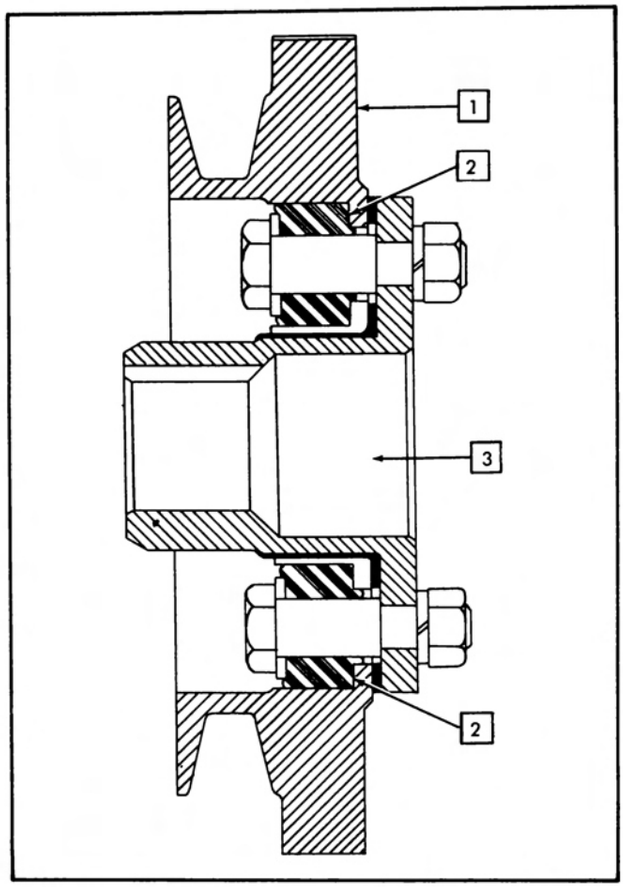
The vibration damper is not adjustable. The screws that retain the rubber are drawn up to the point where the shoulders will limit the tension of the rubber blocks (Fig. 53).

If it is necessary to replace the vibration damper, the replacement part must have the balancing holes drilled to the same size, depth, and angular location as the original damper to maintain the perfect balance of the crankshaft.

FLYWHEEL

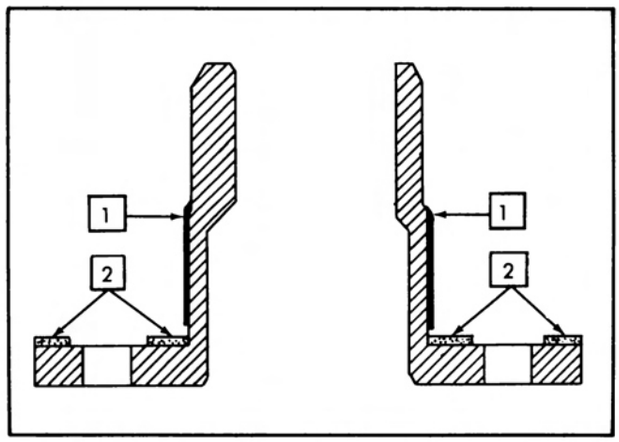
"Ambassador" and "Statesman" Series (With Hydra-Matic)

The flywheel used with Hydra-Matic transmission is a stamped plate type with starter gear teeth cut on the outer periphery.



1. Pulley 2. Rubber Blocks 3. Pulley Hub

FIGURE 53—*Vibration Damper Assembly*



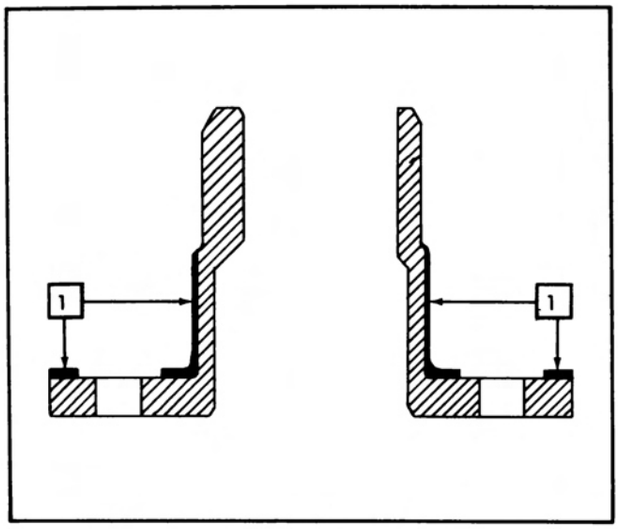
1. Rubber Insulator 2. Anti-Friction Disc

FIGURE 54—*Vibration Damper Hub "Ambassador" Series.*

Flywheels in these series are independently balanced. The crankshafts are dynamically and statically balanced individually.

All Series (Regular Transmission and Overdrive)

The flywheel, on which the starter ring gear is mounted, is balanced as an assembly with the crankshaft and vibration damper.



1. One Piece Rubber Insulator

FIGURE 55—*Vibration Damper Hub "Statesman" and "Rambler" Series.*

When a flywheel is replaced, it is important that the balance holes be duplicated as to size, depth, and angular location. After replacing the flywheel, tighten the crankshaft to flywheel stud nuts with a torque wrench.

Torque Specifications

100-110 foot pounds

STARTER RING GEAR

With the exception of the flywheel as used with the automatic transmission, which is a steel stamping, the starter ring gear can be replaced by placing the flywheel in an arbor press with steel blocks equally spaced around the gear.

To install the starter ring gear, first heat it to expand the inside diameter so that it can be pressed over the flywheel.

CLUTCH SHAFT PILOT BEARING

The pilot bearing for the clutch shaft is located at the center of the rear end of the crankshaft. This is an oil impregnated bronze bearing. It is pressed into the end of the crankshaft. This bearing does not require any lubrication after assembly. When assembled in service, it is advisable to place a small amount of high melting point grease on the end of the clutch shaft as it is installed into the bearing. Bearings being installed must be of the correct size for the series and type of transmission.

LUBRICATION SYSTEM

The lubrication system is the full pressure type with the one exception of the piston pin in the "Statesman" and "Rambler" Series.

Pressure is supplied by a gear driven, gear type, positive pressure pump.

"Ambassador" Series

The oil pump is mounted on the center main bearing cap (Fig. 56).

The oil pump shaft operates, in a thin walled bushing, which is pressed into the engine block at the upper end, and into the oil pump body at the lower end. The thrust of the pump is taken by a loose steel ball at the lower end of the pump body.

After the oil pan has been removed, the bushing can be removed and replaced from below by removing the pump assembly and shaft. The bushing must be reamed to .500″ diameter after it

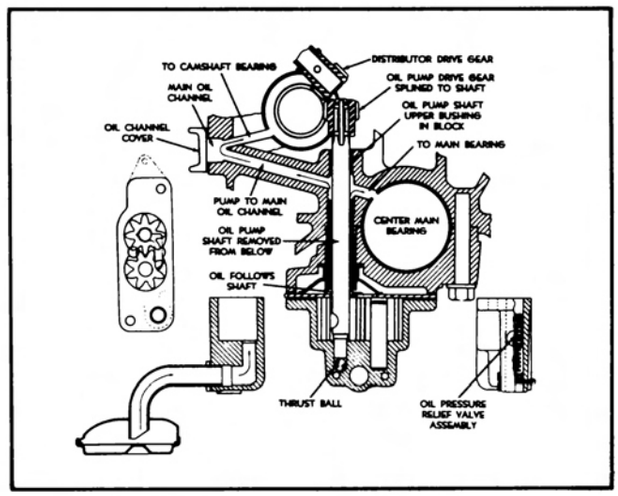
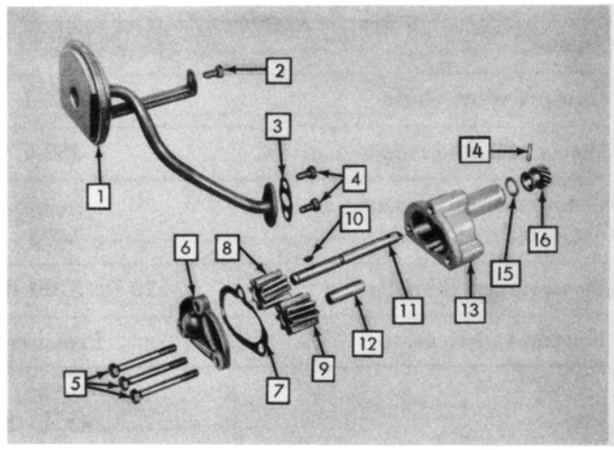
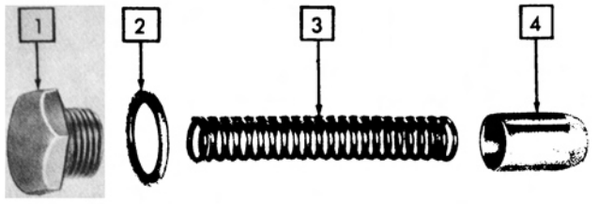


FIGURE 56—*Oil Pump Assembly "Ambassador" Series.*



1. Screen and Retainer
2. Bolt
3. Inlet Tube Gasket
4. Bolts
5. Cap Screws
6. Oil Pump Cover
7. Gasket
8. Drive Gear (In Pump)
9. Idle Gear
10. Key
11. Oil Pump Drive Shaft
12. Oil Pump Idle Shaft
13. Oil Pump Body
14. Oil Pump Drive Gear Pin
15. Thrust Washer
16. Oil Pump Drive Gear

FIGURE 57—*Oil Pump "Statesman" and "Rambler" Series.*



1. Housing Plug
2. Gasket
3. Spring
4. Plunger

FIGURE 58—*Oil Pressure Relief Valve ("Statesman" and "Rambler" Series Shown).*

is replaced. Excessive clearance at this point will cause low oil pressure.

The inlet tube and screen assembly is attached to the bottom and rear part of the oil pump body.

CAUTION: *Always maintain a tight connection between the inlet flange and oil pump body.*

"Statesman" and "Rambler" Series

The oil pump is mounted on the outside of the engine block on the right side.

CAUTION: *Always maintain a tight connection between the oil pump inlet flange and oil inlet hole located on the right side at the bottom of the cylinder block.*

OIL PRESSURE RELIEF VALVE

"Ambassador" Series

On this series, the oil pressure relief valve is located in the body of the oil pump (Fig. 56).

The oil pressure relief valve is not adjustable. A setting of 50-58 pounds pressure is built into the tension of the spring.

"Statesman" and "Rambler" Series

The oil pressure relief valve consists of a plunger spring and retainer. It is located in the cylinder block at the point where the oil enters the oil distribution channel.

The oil pressure relief valve is not adjustable. A setting of 50-58 pounds pressure is built into the tension of the spring (Fig. 58).

ENGINE SPECIFICATIONS

Series	"Ambassador"	"Statesman"	"Rambler"
Type	Valve-In Head	L-Head	L-Head
No. of Cylinders	6	6	6
Bore	3½"	3⅛"	3⅛"
Stroke	4⅜"	4¼"	3¾"
Compression Ratio	7.25-1	7.0-1	7.25-1
Piston Displacement Cu. In.	252.6	195.6	172.6
Compression Pressure at Cranking Speed	120#	120#	120#
Horsepower SAE Brake	120 @ 3700 R.P.M.	88 @ 3800 R.P.M.	82 @ 3800 R.P.M.
Engine Lubrication	Pressure	Pressure	Pressure

OIL SYSTEMS

Series	"Ambassador"	"Statesman"	"Rambler"
Oil Pump Type	Gear	Gear	Gear
Normal Oil Pressure	30# @ 20 M.P.H. 12# Min. @ 600 R.P.M.	30# @ 20 M.P.H. 12# Min. @ 600 R.P.M.	30# @ 20 M.P.H. 12# Min. @ 600 R.P.M.
Oil Pressure Release	50-58#	50-58#	50-58#
Engine Oil Refill Capacity	6 Qts.	5 Qts.	5 Qts.

ENGINE SECTION

CRANKSHAFT AND BEARINGS

Series	"Ambassador"	"Statesman" and "Rambler"
Bearing Type	Replaceable	Replaceable
No. of Main Bearings	7	4
Main Bearing Clearance	.001"-.002"	.001"-.002"
Diameter	2.479"	2.479"
Shaft End Play	.006"-.008"	.006"-.008"
End Thrust Taken By	Center Main Brg.	Front Main Brg.
Bearing Cap Adjustment	66-70 Ft. Lbs. (Dry)	66-70 Ft. Lbs. (Dry)

VALVE SPECIFICATIONS

Series	"Ambassador"	"Statesman" and "Rambler"
Stem Diameter		
Intake	.3720"-.3730"	.3407"-.3412"
Exhaust	.3725"-.3735"	.3407"-.3412"
Stem to Guide Clearance	.002"-.004"	.0013"-.0047"
Head Diameter Intake	1.787"	1.469"
Head Diameter Exhaust	1.468"	1.281"
Seat Angle	45° Ex. 30° Int.	45°
Valve Face Angle	44° Ex. 29° Int.	44°
Valve Spring Free Height	2 1/16"	2 5/32"
Valve Spring Pressure		
Valve Open	144-154# @ 1 7/16"	75-82# @ 1 7/16"
Valve Closed	53-58# @ 1 13/16"	37-41# @ 1 3/4"
Spring Retainer Lock	Split Two-Piece	Single Horseshoe
Tappet Clearance (Running Hot)		
Intake	.012"	.015"
Exhaust	.016"	.015"
Cold Setting		
Intake		.016"
Exhaust		.018"

PISTON RINGS

Series	"Ambassador"	"Statesman" and "Rambler"
No. of Rings Per Piston	4	4
End Gap Minimum (Except "U" Flex Ring)	.007"	.010"
Compression Ring Width	.0930"-.0935"	.0930"-.0935"
Oil Ring Width	.1545"-.1550"	.1545"-.1550"
Compression Ring, Side Clearance in Ring Groove	.002" to .004"	.002" to .004"
Oil Ring, Side Clearance in Ring Groove	.002" to .004"	.002" to .004"

CONNECTING ROD AND BEARING

Series	"Ambassador"	"Statesman" and "Rambler"
Bearing Type	Replaceable	Replaceable
Bearing Clearance	.001"-.0025"	.001"-.0025"
Crank Pin Diameter	2.000"	2.094"
Bearing End Play	.005".015"	.005"-.015"
Bearing Cap Adjustment	52-56 Ft. Lbs. (Dry)	27-30 Ft. Lbs. (Dry)

TUNE-UP DATA

Series	Plug Gap	Tappet Clr. Hot	Dist. Point Gap	Dwell Angle	Ignition Timing (Vibration Damper)
"Ambassador"	.030"	Int. .012" Ex. .016"	.018"-.024"	31-37°	T.D.C.
"Statesman"	.030"	.015"	.018"-.024"	31-37°	T.D.C.
"Rambler"	.030"	.015"	.018"-.024"	31-37°	T.D.C.

Engine Idle Speed—
500-550 R.P.M. (Std. and O.D.)

375 R.P.M. Exact (Hydra-Matic)
Selector lever in neutral position. Engine at normal operating temperature.

Compression pressure at cranking speed 120 lbs.

Spark advance (See Electrical Section—Distributor).

Firing Order—1, 5, 3, 6, 2, 4

Positive battery terminal grounded

Coil—Secondary terminal tower, negative polarity

Breaker point spring tension, distributor 17-21 ozs.

Spark Plugs—Auto-Lite—A7A.
Optional—Champion J-10, AC-44 14 mm. thread, maximum torque 30 lbs.

Cylinder Head Stud Nut Torque Specifications:
"Ambassador" Series—65-70 Ft. Lbs.

"Statesman" and "Rambler" Series 57-60 Ft. Lbs.

TECHNICAL SERVICE LETTER REFERENCE

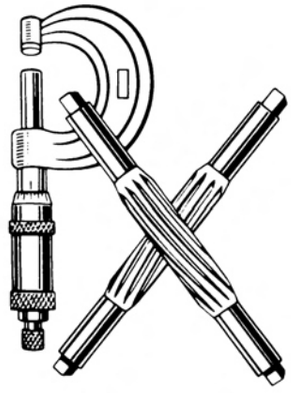
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TECHNICAL SERVICE MANUAL



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COOLING SYSTEM

COOLING SYSTEM

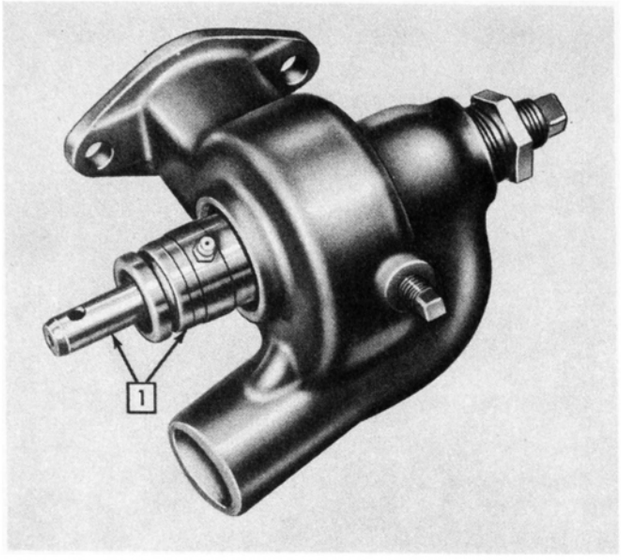
WATER PUMPS

The water pumps are of the centrifugal blade type with a sealed-in shaft sealing assembly (Fig. 1). The seals are held tight to the shaft under tension from the seal gland spring and are non-adjustable (Items 3, 11, and 12, Fig. 2).

The seal assembly is of the cartridge type installed and serviced as a unit. It is mounted and sealed in the pump body by means of a flexible rubber ring (Item 13, Fig. 2, and Item 4, Fig. 3).

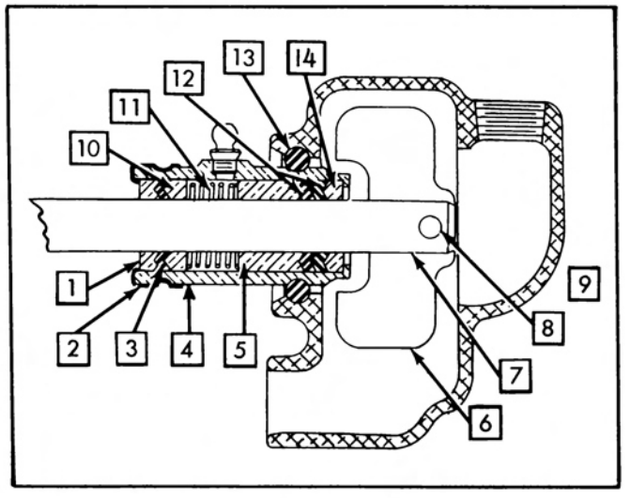
This design permits the entire seal bearing cartridge to align itself with the shaft. The seal will aid in absorbing radial loads imposed by the hydraulic forces on the impeller.

The seal gland spring chamber acts as a reservoir for the lubricant to lubricate the shaft and bushing.



1. Sealed-In Shaft Sealing Assembly

FIGURE 1—*Water Pump "Ambassador" Series.*



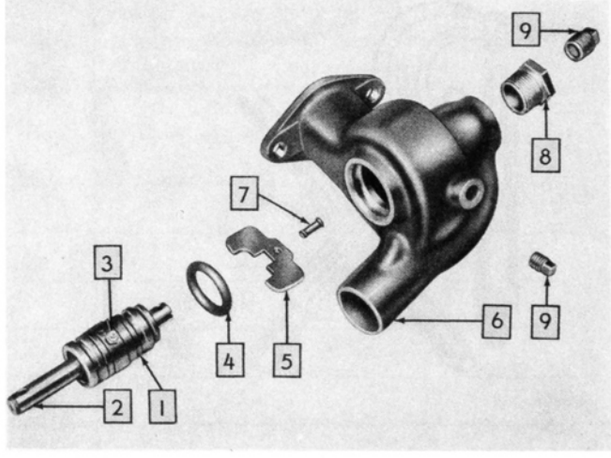
1. Outer Water Pump Seal Gland
2. Water Pump Seal Housing Cap
3. Water Pump Seal
4. Water Pump Seal Housing
5. Water Pump Shaft Bushing
6. Water Pump Impeller
7. Water Pump Shaft
8. Rivet
9. Water Pump Housing
10. Inner Water Pump Seal Gland
11. Water Pump Seal Gland Spring
12. Inner Water Pump Seal
13. Water Pump Seal Housing Rubber Retaining Ring
14. Inner Water Pump Seal Gland

FIGURE 2—*Water Pump Assembly "Statesman" and "Rambler" Series.*

WATER PUMP DISASSEMBLY

The water pump impeller is installed in the slotted end of the water pump shaft held in place by a tubular brass rivet. A removable plug in the pump body permits the removal and installation of this rivet (Item 8, Fig. 2). By removing the plug and supporting the shaft through the water outlet hole, the rivet can be drilled or driven out.

The seal and shaft assembly can then be pulled out of the water pump body (Fig. 3).



1. Water Pump Seal Assembly
2. Water Pump Shaft
3. Water Pump Grease Fitting
4. Water Pump Seal Housing Rubber Retaining Ring
5. Water Pump Impeller
6. Water Pump Body
7. Impeller Rivet
8. Heater Reducer Fitting
9. Pipe Plugs

FIGURE 3—*Water Pump Assembly Sequence "Ambassador" Series Shown.*

ASSEMBLY OF WATER PUMP

To assemble the water pump, first insert a new rubber retaining ring in the water pump body. Then apply a rubber lubricant to the inner diameter of the rubber ring. This will aid in installing the seal assembly and shaft.

Install the impeller on the shaft and fasten the impeller to the shaft with a new brass rivet. Always install a new gasket when replacing water pump to block. Use a generous amount of gasket seal.

COOLING SYSTEM

RADIATOR

The radiator is of the vertical flow type with the conventional expansion tank located on top of the tube section.

Whenever possible, water or anti-freeze solutions should be added to the radiator when the cooling system is cold and then only when the level has dropped to a point where it barely covers the radiator tubes. This precaution will prevent the constant loss of coolant, as water expands approximately one-quarter pint per gallon when heated from 40° to 180° Fahrenheit.

The Weather Eye valve must be in the wide open position when refilling or flushing the cooling system. The engine must be idling during the refilling operation to eliminate the possibility of trapped air interfering with circulation or weather eye operation.

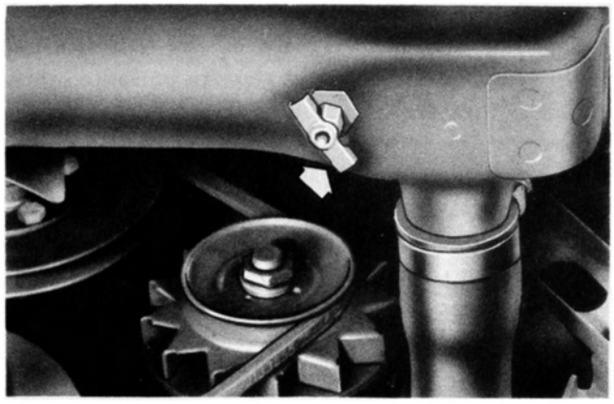


FIGURE 4—*Radiator Drain "Ambassador" Series.*

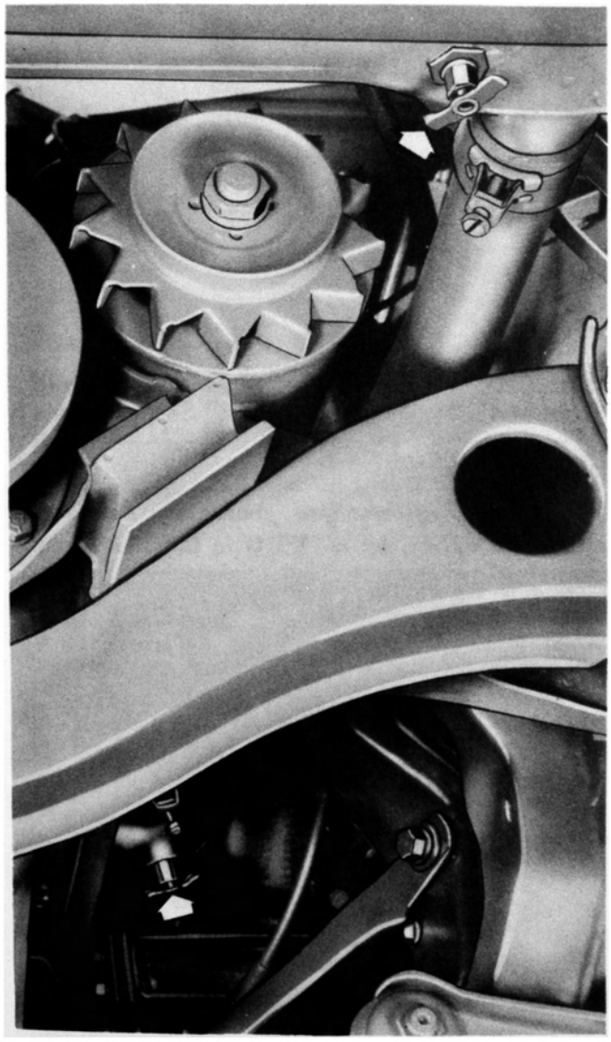


FIGURE 5—*Radiator and Water Pump Drains "Statesman" Series Shown.*

DRAIN COCKS

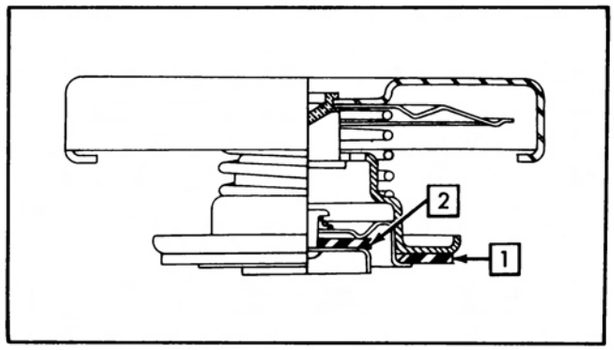
A drain cock is provided at the bottom of the "Ambassador" and "Statesman" Series radiator (Figs. 4 and 5). Figure 5 illustrates the drain cock located on the water pump on the "Statesman" and "Rambler" Series.

COOLING SYSTEM CAPACITIES

"Ambassador" Series	17 qts.
"Statesman" Series	14 qts.
"Rambler" Series	11 qts.
Weather Eye Equipped—Add	1 qt.

RADIATOR PRESSURE TYPE FILLER CAP

All series employ a pressurized type of cooling system. The increase in pressure is obtained by the use of a positive type sealed radiator cap. This cap incorporates two valves: a pressure relief valve and a vacuum relief valve (Fig. 6).



1. Pressure Valve Seal (Relieves at 7 lbs. of Pressure)
2. Vacuum Relief Valve (Air Vent)

FIGURE 6—*Pressure Type Radiator Filler Cap.*

The advantage of the pressure system is that the coolant will maintain a higher boiling point. This will permit higher engine operating temperatures with more efficient control.

With this system, anti-freeze solutions will be retained longer as the loss through evaporation will be prevented.

THERMOSTAT

A thermostat is used in the cooling system to insure proper engine operating temperatures for maximum economy and longer engine life.

Figure 7 illustrates the service replacement thermostat, 170° Dole (capsule type).

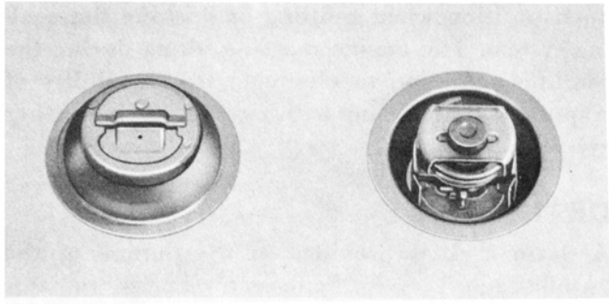


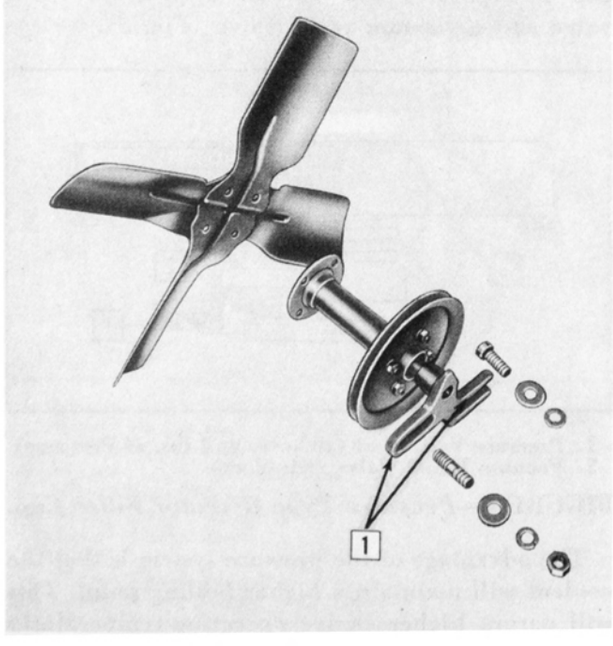
FIGURE 7—*Thermostat (Capsule Type)*

The thermostat is located in the cylinder head water outlet housing. It should always be used, as it is possible to over-cool an engine as well as over-heat it.

Testing a Thermostat

The opening point of the thermostat should be at a temperature of 167° to 173°. The wide open point of the thermostat should be 20° above the opening point.

NOTE: *When servicing the cooling system at any time, particularly when installing anti-freeze, the thermostat must be checked.*



1. Fan Belt Adjustment Slots

FIGURE 8—*Fan Assembly "Ambassador" Series.*

Gaskets must be installed on both sides of the outer flange of the thermostat in the thermostat housing.

FAN ASSEMBLY

The cooling system has a four-blade fan which provides efficient cooling at low road speeds and for engine idling operation.

The fan hub bearings are of the ball bearing type. These bearings do not require periodic lubrication as they are packed and sealed during manufacture.

The fan mounting bracket, at the front of the engine block, is provided with a slot that allows for the adjustment of the fan belt as shown in Figures 8 and 9.

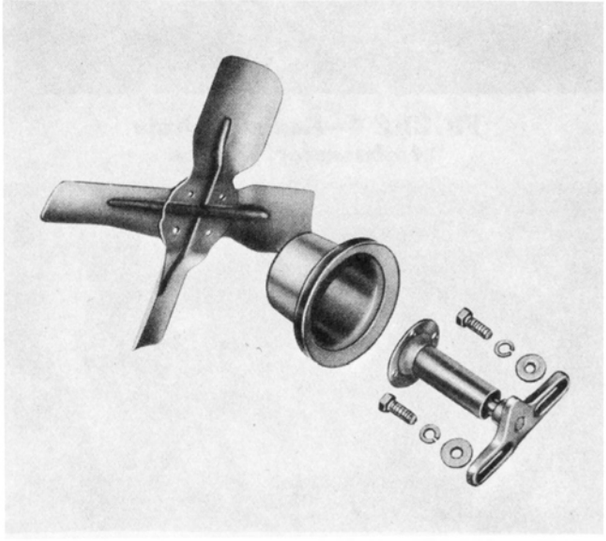


FIGURE 9—*Fan Assembly "Statesman" and "Rambler" Series ("Statesman" Series Shown).*

FAN BELT

The cooling system fan, generator, and water pump are driven by a "V" type fan belt from a

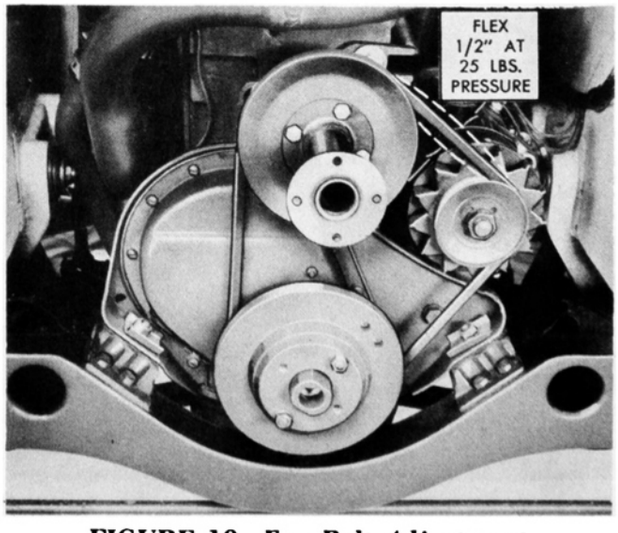


FIGURE 10—*Fan Belt Adjustment.*

pulley on the vibration damper. This pulley and vibration damper is mounted on the front end of the crankshaft.

FAN BELT ADJUSTMENT

The fan belt is adjusted by moving the fan assembly, on its mounting, in a horizontal plane. The fan belt should be adjusted so that upon application of 25 pounds pressure, at a point midway between the fan and generator pulleys, it will deflect approximately ½ inch.

It is important that the proper tension of the fan belt be maintained to insure efficient operation of the cooling and electrical systems. Too much tension will cause excessive wear on the fan and generator bearings.

TECHNICAL SERVICE LETTER REFERENCE

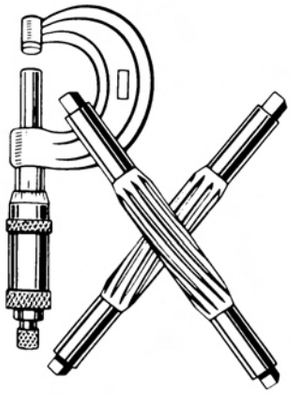
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TECHNICAL SERVICE LETTER REFERENCE

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Nash

TECHNICAL SERVICE MANUAL



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ELECTRICAL

ELECTRICAL SECTION

BATTERIES (Auto-Lite)

Specifications

"Ambassador" Series
CT-1-15, 20 Hrs. 105 A.H., 20 Min. 133 Amps.

"Statesman" Series
IM-100, 20 Hrs. 100 A.H., 15 Plates.

"Rambler" Series
IM-100, 20 Hrs. 100 A.H., 15 Plates.

The battery is a three cell, six volt unit with adequate storage capacity for the normal requirements of the car including the approved accessories.

It is located under the hood on the left side of the engine compartment near the fire wall on the "Ambassador" and "Rambler" Series. The "Statesman" location is forward on the left side of the engine compartment. These locations make it readily accessible for inspection, servicing, or removal.

CAUTION: *Always install the battery with a positive ground.*

Connecting Cables

Use only genuine Nash cables to insure the proper ground connections. Undersize cables reduce starting ability. Always apply vaseline to the hold-down clamp, nuts, and terminal connections when the battery is installed.

Servicing of Battery

The battery should be inspected every month or every 1,000 miles. The addition of water, particularly in cold weather, should be made just before operating the car above charging speed. This insures mixture of the water with the acid.

Be sure that the height of the liquid in each cell is not less than $\frac{3}{8}$" and not more than $\frac{1}{2}$" over the top of the separators.

Battery Testing

At regular intervals, each cell of the battery should be tested with a hydrometer. The battery should register not less than 1.250 specific gravity in climates where freezing occurs, and not less than 1.225 under more moderate conditions.

CAUTION: *When replacing a battery in the carrier, do not tighten the hold-down clamp wing nuts excessively. It is unnecessary and will cause distortion of the battery case.*

Discharge Causes

Following are a few of the factors that contribute to the discharge of a battery in use:

Improper regulator settings.
Oxidized regulator contact points.
Loose or corroded battery terminals.
High resistant ground connections.
Short circuits in wiring and terminal blocks.

GENERATOR

The Delco-Remy Model 1102776 and 1102777 generators are a six volt, 4.630 inch diameter frame size, two brush shunt unit with a ball bearing supporting the armature at the drive end and a bronze bushing in the commutator end. It is force draft ventilated by means of a fan mounted behind the drive pulley which rotates with the armature shaft. The generator output is regulated by the correct settings of the current and voltage regulator.

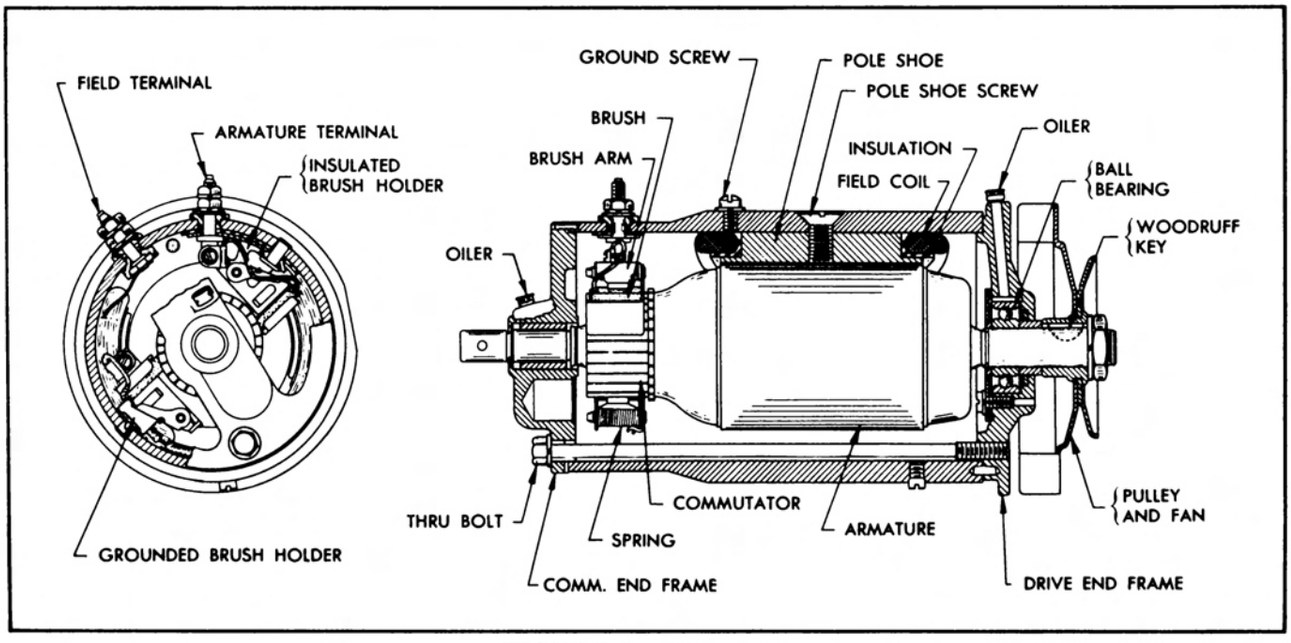


FIGURE 1—*Generator.*

Lubrication

The two hinge cap oilers should be supplied with 10 to 20 drops of light engine oil every 5,000 miles of operation. Do not oil excessively. NEVER OIL COMMUTATOR.

Inspection

The generator should be removed and disassembled to inspect the commutator and brushes at regular intervals. If the commutator is dirty, it may be cleaned with No. 00 sandpaper. Blow out all dust after cleaning. NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR. If the commutator is rough, out of round, or has high mica, it should be turned down in a lathe and the mica undercut $\frac{1}{32}$" (Fig. 2).

Worn brushes should be replaced. Brushes should be free in their holders.

Check the brush spring tension which should be 28 ounces.

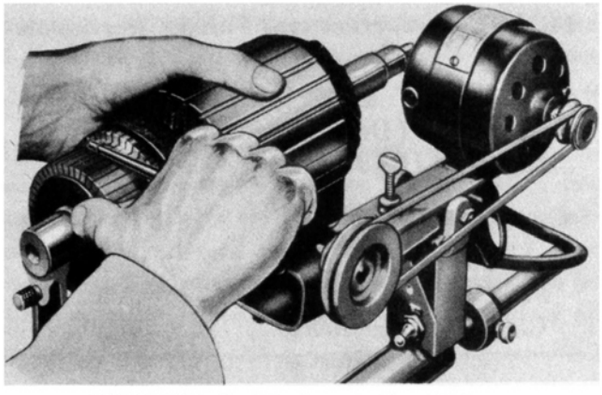


FIGURE 2—*Undercutting Mica.*

Generator Disassembly

At regular intervals, (actual mileage or time depending on the type of operation) the generator should be disassembled for a thorough cleaning and inspection of all parts. Never clean the armature or fields in any degreasing tank, or with grease dissolving materials, since these may damage the insulation. The ball bearing should be cleaned and repacked with a good grade of ball bearing grease. The commutator should be trued in a lathe and the mica undercut if necessary. All wiring and connections should be checked. Rosin flux should be used in making soldered connections. Acid flux must never be used on electrical connections.

Checking Inoperative Generator

Several conditions may require removal of the generator from the engine and further checking of the generator as follows:

1. No Output
2. Unsteady or Low Output
3. Excessive Output
4. Noisy Generator

1. No Output

Remove the generator, disassemble, and check for sticking or worn brushes and burned commutator bars. Burned bars, with other bars fairly clean, indicate open circuited armature coils. Then reassemble the generator. If the brushes are making a good contact with the commutator and the commutator appears satisfactory, use test leads and continuity light and check as follows:

a. Raise grounded brush through cooling vent openings. Check with test points from "A" terminal to frame. Light should not light. If it does, the generator is grounded; raise the other brush from commutator and check field commutator and brush holder to locate ground.

b. If generator is not grounded, check field for open circuit.

c. If the field is not open, check for shorted field. Field draw at six volts, 80° temperature should be 1.90 amperes to 2.05 amperes on the "Ambassador" and "Statesman" Series; 1.75–1.9 draw "Rambler" Series. Excessive current draw indicates a shorted field.

d. If trouble has not been located, remove the armature and check on growler for short circuit.

2. Unsteady or Low Output

Check as follows:

a. Check drive belt tension.

b. Check brush spring tension and brushes for sticking.

c. Inspect commutator for roughness, grease and dirt, dirt in slots, high mica, out of round, or burned bars. With any of these conditions, the commutator must be turned down in a lathe and the mica undercut. In addition, when burned bars indicate an open circuit, the open circuit condition must be eliminated or the armature replaced.

3. Excessive Output

Excessive output usually results from grounded generator field—grounded either internally or in the regulator. Opening the field circuit,

(disconnecting lead from "F" terminal of regulator or generator) with the generator operating at a medium speed, will determine which unit is at fault. If the output drops off, the regulator is causing the condition. If the output remains high, the field is grounded in the generator either at the pole shoes, leads, or at the "F" terminal.

4. Noisy Generator

Noisy generator may be caused by loose mounting or drive pulley, worn, dry, or dirty bearings, or improperly seated brushes.

Installation Caution

After the generator is reinstalled on the engine, or at any time after leads have been disconnected and then reconnected to the generator, a jumper lead should be connected MOMENTARILY between the BATTERY and ARMATURE terminals of the regulator before starting the engine. This allows a momentary surge of current from the battery to the generator which correctly polarizes the generator with respect to the battery it is to charge.

Specifications

"Ambassador" and "Statesman" Series (Delco-Remy Model 1102777)

Armature rotation—clockwise viewing the drive end—45 amperes at 8.0 volts at 2350 Generator R.P.M. (maximum output controlled by setting of current regulator unit).

Brush spring tension—28 ounces.

Field current as six volts (at 80° F.) 1.9 to 2.05 amperes.

"Rambler" Series (Delco-Remy Model 1102776)

Armature rotation—clockwise viewing the drive end—30 amperes at 8.0 volts at 1900 Generator R.P.M. (maximum output controlled by setting of current regulator unit).

Brush spring tension—28 ounces.

Field current as six volts (at 80° F.) 1.75 to 1.90 amperes.

CURRENT AND VOLTAGE REGULATORS

The Delco-Remy Models 1118731 and 1118732 (six volt) current and voltage regulators (Fig. 3) are designed for operation with a positive grounded battery, and have the following specifications:

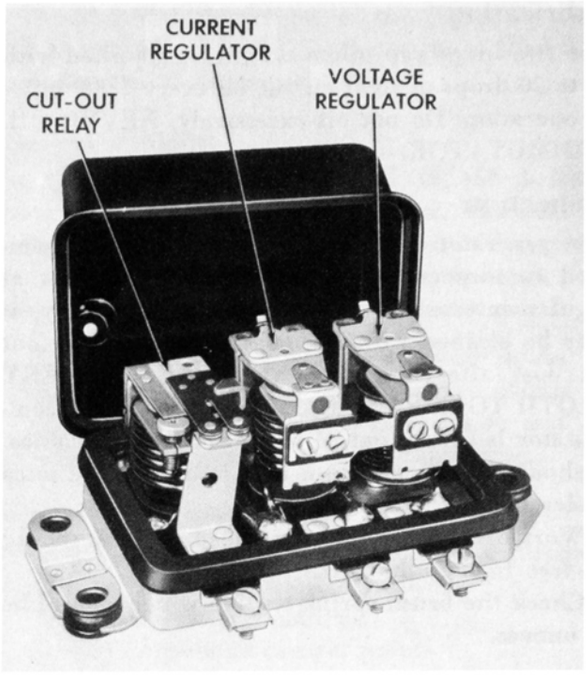


FIGURE 3—*Current and Voltage Regulator.*

"Ambassador" and "Statesman" Series Regulator (Delco-Remy Model 1118732)

Cut-Out Relay

Air Gap	.020"
Point Closing	.020"
*Closing Voltage Range	5.9—6.7 Volts
Adjust to	6.4 Volts

Current Regulator

Air Gap	.075"
*Current Setting Range	45—51 Amperes
Adjust to	47 Amperes

Voltage Regulator

Air Gap	.075"
*Voltage Setting Range	7.0—7.7 Volts
Adjust to	7.4 Volts

"Rambler" Series Regulator (Delco-Remy Model 1118731)

Cut-Out Relay

Air Gap	.020"
Point Opening	.020"
*Closing Voltage Range	5.9—6.7 Volts
Adjust to	6.4 Volts

Current Regulator

Air Gap	.075"
*Current Setting Range	34—42 Amperes
Adjust to	38 Amperes

Voltage Regulator

Air Gap	.075"
*Voltage Setting Range	7.0–7.7 Volts
Adjust to	7.4 Volts

NOTE: *Adjustment need not be made if check shows value within range given. When adjustment is necessary, adjust to specified value.*

*Current and voltage specifications apply only at operating temperatures. Operating temperature shall be assumed to exist after not less than 15 minutes of continuous operation with a charge rate of 8 to 10 amperes.

CONSTRUCTION AND OPERATION

The three unit regulator is designed for use with Delco-Remy shunt type generators with externally grounded field circuits. The regulator contains a cutout relay, a voltage regulator, and a current regulator. Construction and operation of each of these units is discussed in the following sections.

Cut-Out Relay

The cut-out relay (Fig. 4) has two windings assembled on one core, a series winding of a few turns of heavy wire (solid line), and a shunt winding of many turns of fine wire (dashed line). The shunt winding is shunted across the generator so that generator voltage is impressed upon it at all

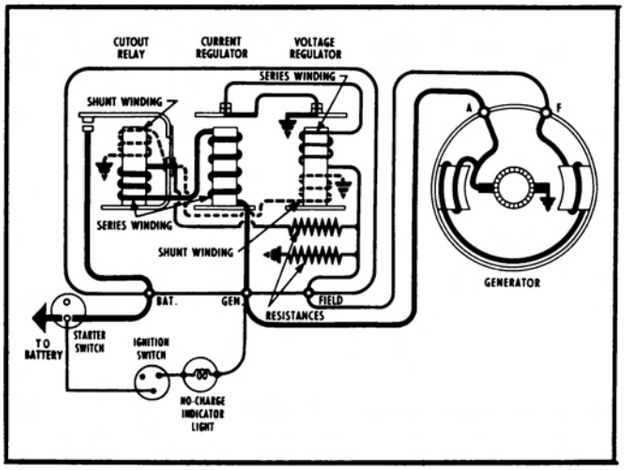


FIGURE 4—*Schematic Drawing of Charging Circuit.*

times. The series winding is connected in series with the charging circuit so that generator output passes through it.

The relay core and windings are assembled into a frame. A flat steel armature is attached to the frame by a flexible hinge so that it is centered just above the end of the core. The armature has two contact points which are located just above a similar number of stationary contact points. When the generator is not operating, the armature contact points are held away from the stationary points by the tension of a flat spring riveted on the side of the armature.

Cut-Out Relay Action

When the generator voltage builds up to a value great enough to charge the battery, the magnetism induced in the relay windings is sufficient to overcome the armature spring tension and pull the armature toward the core so that the contact points close. This completes the circuit between the generator and battery. The current which flows from the generator to the battery passes through the series winding in the proper direction to add to the magnetism holding the armature down and the contact points closed.

When the generator slows down or stops, current begins to flow from the battery to the generator. This reverses the direction that the current flows through the series winding, thus causing a reversal of the series winding magnetic field. The magnetic field of the shunt winding does not reverse. Therefore, instead of helping each other, the two windings now magnetically oppose so that the resultant magnetic field becomes insufficient to hold the armature down. The flat spring pulls the armature away from the core so that the points separate; this opens the circuit between the generator and battery.

Voltage Regulator

The voltage regulator (Fig. 4) has two windings assembled on a single core, a shunt winding consisting of many turns of fine wire (shown as dashed line) which is shunted across the generator, and a series winding of a few turns of relatively heavy wire (shown as solid line) which is connected in series with the generator field circuit when the regulator contact points are closed.

The windings and core are assembled into a frame. A flat steel armature is attached to the frame by a flexible hinge so that it is just above the end of the core. The armature contains a contact point which is just beneath a stationary contact point. When the voltage regulator is not operating, the tension of a spiral spring holds the armature away from the core so that the points are in contact and the generator field circuit is completed to ground through them.

Voltage Regulator Action

When the generator voltage reaches the value for which the voltage regulator is adjusted, the magnetic field produced by the two windings (shunt

and series) overcomes the armature spring tension and pulls the armature down so that the contact points separate. This inserts resistance into the generator field circuit so that the generator field current and voltages are reduced. Reduction of the generator voltage reduces the magnetic field of the regulator shunt winding. Also, opening the regulator points opens the regulator series winding circuit so that its magnetic field collapses completely. The consequence is that the magnetic field is reduced sufficiently to allow the spiral spring to pull the armature away from the core so that the contact points again close. This directly grounds the generator field circuit so that the generator voltage and output increase. The above cycle of action again takes place and the cycle continues at a rate of 150 to 250 times a second regulating the voltage to a constant value. By thus maintaining a constant voltage, the generator supplies varying amounts of current to meet the varying stages of battery charge and electrical load.

Current Regulator

The current regulator has a series winding of a few turns of heavy wire (shown as solid line) which carries all generator output. The winding core is assembled into a frame. A flat steel armature is attached to the frame by a flexible hinge so that it is just above the core. The armature has a contact point which is just below a stationary contact point. When the current regulator is not operating, the tension of a spiral spring holds the armature away from the core so that the points are in contact. In this position, the generator field circuit is completed to ground through the current regulator contact points in series with the voltage regulator contact points.

Current Regulator Action

When the load demands are heavy, as for example, when electrical devices are turned on and the battery is in a discharged condition, the voltage may not increase to a value sufficient to cause the voltage regulator to operate. Consequently generator output will continue to increase until the generator reaches rated maximum. This is the current value for which the current regulator is set. Therefore, when the generator reaches rated output, this output, flowing through the current regulator winding, creates sufficient magnetism to pull the current regulator armature down and open the contact points. With the points open, resistance is inserted into the generator field circuit so that the generator output is reduced.

As soon as the generator output starts to fall off, the magnetic field of the current regulator winding is reduced, the spiral spring tension pulls the armature up, the contact points close and directly connect the generator field to ground. Output increases and the above cycle is repeated. The cycle continues to take place while the current regulator is in operation 150 to 250 times a second preventing the generator from exceeding its rated maximum.

When the electrical load is reduced (electrical devices turned off or battery comes up to charge), then the voltage increases so that the voltage regulator begins to operate and tapers the generator output down. This prevents the current regulator from operating. Either the voltage regulator or the current regulator operates at any one time. The two do not operate at the same time.

Resistances

The current and voltage regulator circuits use a common resistance (Fig. 4) which is inserted in the field circuit when either the current or voltage regulator operates. A second resistance (Fig. 4) is connected between the regulator field terminal and the relay frame which places it in parallel with the generator field coils. The sudden reduction in field current occuring when either the current or voltage regulator contact points open is accompanied by a surge of induced voltage in the field coils as the strength of the magnetic field changes. These surges are partially dissipated by the two resistances, thus preventing excessive arcing at the contact points.

Temperature Compensation

Voltage regulators are compensated for temperature by means of a bi-metal thermostatic hinge on the armature. This causes the regulator to regulate for a higher voltage when cold which partly compensates for the fact that a higher voltage is required to charge a cold battery.

Regulator Polarity

Some regulators are designed for use with negative grounded batteries while other regulators are designed for use with positive grounded batteries. Using the wrong polarity regulator on an installation will cause the regulator contact points to pit badly and give very short life. As a safeguard against installation of the wrong polarity regulator, regulators designed for positive grounded systems have copper plated current and voltage regulator armatures while regulators for negative grounded systems have cadmium plated armatures.

REGULATOR MAINTENANCE

General Instructions

Mechanical checks and adjustments (air gaps, point opening) must be made with battery disconnected and regulator preferably off the vehicle.

CAUTION: *The cut-out relay contact points must never be closed by hand with the battery connected to the regulator. This would cause a high current to flow through the units which would seriously damage them.*

Electrical checks and adjustments may be made either on or off the vehicle. The regulator must always be operated with the type generator for which it was designed.

The regulator must be mounted in the operating position when electrical settings are checked and adjusted, and it must be at operating temperature.

After regulator removal for any tests or adjustments, the generator on the vehicle, must be repolarized after leads are connected but before the engine is started as follows:

Repolarizing Generator

After reconnecting leads, momentarily connect a jumper lead between the "Gen" and "BAT" terminals of the regulator. This allows a momentary surge of current to flow through the generator which correctly polarizes it. Failure to do this may result in severe damage to the equipment since reversed polarity causes vibration, arcing, and burning of the relay contact points.

QUICK CHECKS OF GENERATOR AND REGULATOR

In analyzing complaints of generator-regulator operation, any of several basic conditions may be found.

1. **Fully Charged Battery and Low Charging Rate.**

   This indicates normal generator-regulator operation. Regulator settings may be checked as outlined in the following section.

2. **Fully Charged Battery and a High Charging Rate.**

   This indicates that the voltage regulator is not reducing the generator output as it should. A high charging rate to a fully charged battery will damage the battery, and the accompanying high voltage is very injurious to all electrical units.

   This operating condition may result from.

   a. Improper voltage regulator setting.
   b. Defective voltage regulator unit.
   c. Grounded generator field circuit (in either generator, regulator, or wiring).
   d. Poor ground connection at regulator.
   e. High temperature which reduces the resistance of the battery to charge so that it will accept a higher charging rate even though the voltage regulator setting is normal.

   If the trouble is not due to high temperature, determine the cause of trouble by disconnecting the lead from the regulator "F" terminal with the generator operating at medium speed. If the output remains high, the generator field is grounded either in the generator or in the wiring harness. If the output drops off, the regulator is at fault and should be checked for a high voltage setting or grounds.

3. **Low Battery and High Charging Rate.**
   This is normal generator-regulator action. Regulator settings may be checked as outlined in the following section.

4. **Low Battery and Low or No Charging Rate.**
   This condition could be due to:

   a. Loose connections, frayed, or damaged wires.
   b. Defective battery.
   c. High circuit resistance.
   d. Low regulator setting.
   e. Oxidized regulator contact points.
   f. Defects within the generator.

   If the condition is not caused by loose connections, frayed, or damaged wires, proceed as follows:

   To determine whether the generator or regulator is at fault, momentarily ground the "F" terminal of the regulator and increase generator speed. If the output does not increase, the generator is probably at fault and it should be checked. If the generator output increases, the trouble is due to:

   a. A low voltage (or current) regulator setting.
   b. Oxidized regulator contact points which insert excessive resistance into the generator field circuit so that output remains low.
   c. Generator field circuit open within the regulator at the connection or in the regulator winding.

5. **Burned Resistances, Windings, or Contacts.**
   These result from open circuit operation or high resistance in the charging circuit. Where burned resistances, windings, or contacts are found, always check car wiring before installing a new regulator. Otherwise, the new regulator may also fail in the same way.

6. **Burned Relay Contact Points.**
   This is due to reversed generator polarity. Generator polarity must be corrected after any checks of the regulator or generator, or after disconnecting and reconnecting leads.

CLEANING CONTACT POINTS

The contact points of a regulator will not operate indefinitely without some attention. It has been

found that a great majority of all regulator trouble can be eliminated by a simple cleaning of the contact points plus some possible readjustment. The flat points should be cleaned with a spoon or riffler file. The flat point is in the upper contact bracket so the bracket must be removed for cleaning the points. A flat file cannot be used successfully to clean the flat contact points since it will not touch the center of the flat point where point wear is most apt to occur. NEVER USE EMERY CLOTH OR SANDPAPER TO CLEAN THE CONTACT POINTS.

REGULATOR CHECK AND ADJUSTMENTS

Cut-Out Relay Checks and Adjustments

The cut-out relay requires three checks and adjustments: air gap, point opening, and closing voltage. The air gap and point opening adjustments must be made with the battery disconnected.

Air Gap

Place fingers on armature directly above the core and move the armature down until points just close, and then measure the air gap between the armature and the center of the core (Fig. 5). Make sure that all points close simultaneously. If they do not, bend the spring finger so they do. To adjust air gap, loosen two screws at the back of the relay and raise or lower the armature as required. Tighten screws after adjustment.

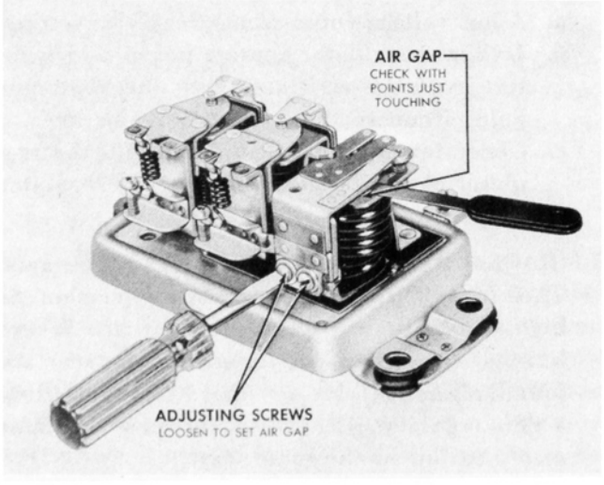


FIGURE 5—*Cut-Out Relay Air Gap Adjustment.*

Point Opening

Check point opening and adjust by bending the upper armature stop (Fig. 6).

Closing Voltage

To check the closing voltage of the cut-out relay, connect the regulator to the proper generator and battery. Connect a voltmeter between the regulator "GEN" terminal and regulator base. Connect an ammeter into this charging circuit at the regulator "BAT" terminal (Fig. 7).

Slowly increase the generator speed and note the relay closing voltage. Adjust closing voltage by turning the adjusting screw (Fig. 8). Turn the screw clockwise to increase spring tension and closing voltage; turn counterclockwise to decrease closing voltage.

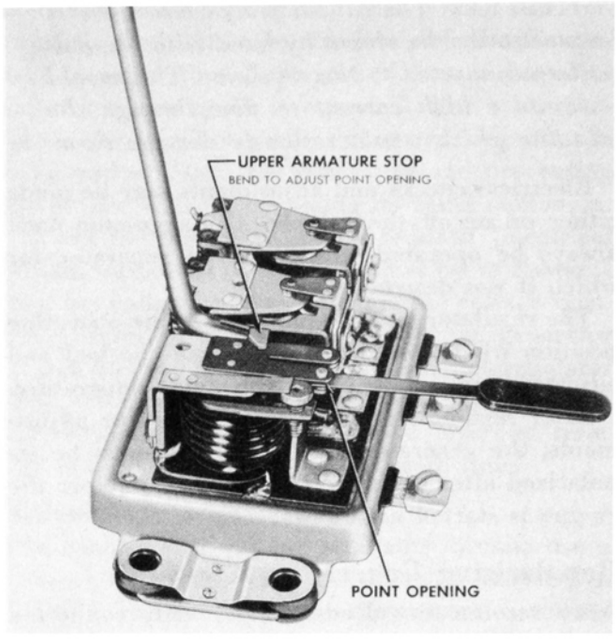


FIGURE 6—*Cut-Out Relay Point Opening Adjustment.*

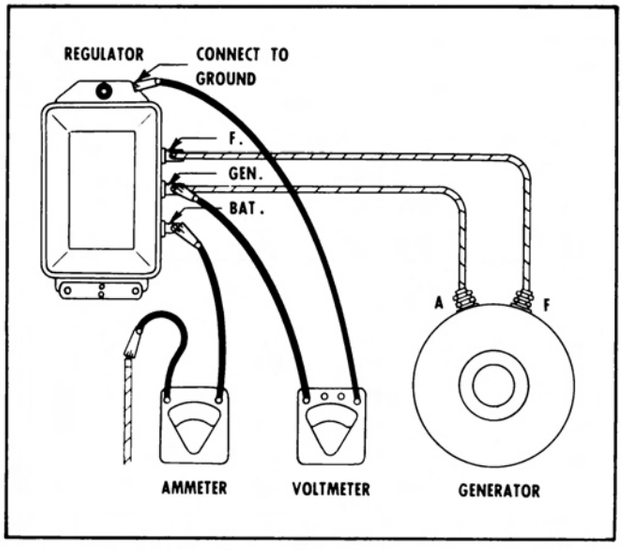


FIGURE 7—*Meter Connections to Check Cut-Out Relay.*

Voltage Regulator Checks and Adjustments

Two checks and adjustments are required on the voltage regulator, air gap and voltage setting.

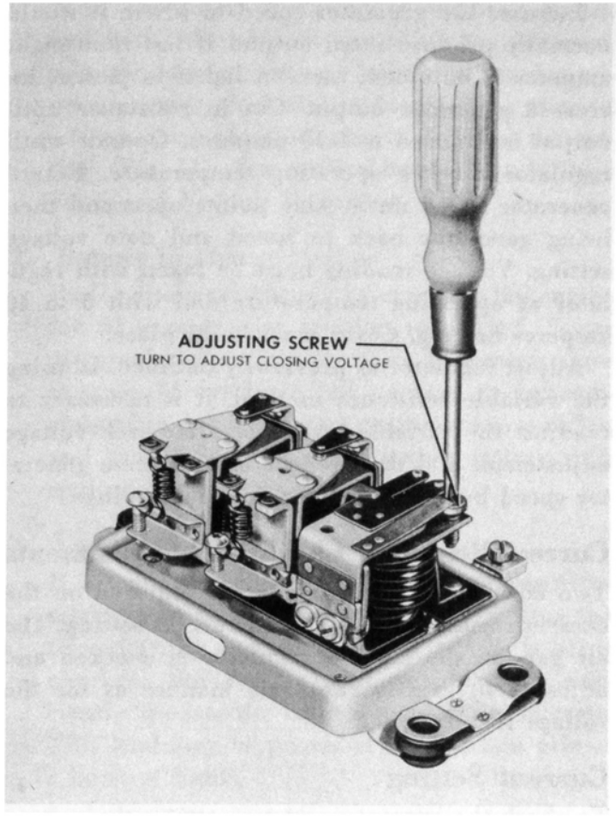


FIGURE 8—*Cut-Out Relay Closing Voltage Adjustment.*

Air Gap

To check the air gap, push the armature down to the core and release it until the contact points just touch, and then measure the air gap (Fig. 9). Adjust by loosening the contact bracket as required. Be sure the points are lined up; retighten the screws after adjustment.

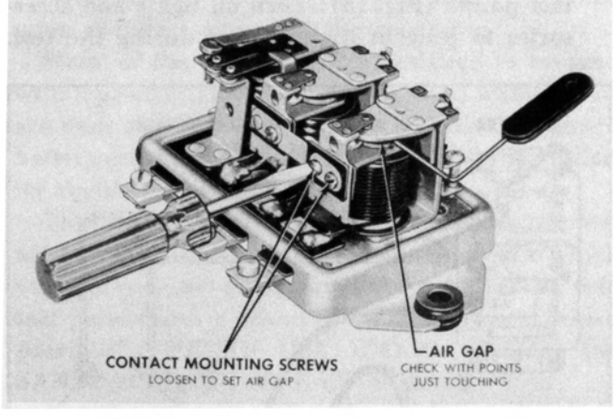


FIGURE 9—*Voltage Regulator Air Gap Adjustment.*

Voltage Setting

There are two ways to check the voltage setting: the fixed resistance method, and the variable resistance method (Figs. 10 and 12).

Fixed Resistance Method

With the fixed resistance method, a fixed resistance is substituted for the external charging circuit by connecting it between the regulator "BAT" terminal and ground in parallel with a voltmeter. The battery lead is disconnected from this terminal (Fig. 10).

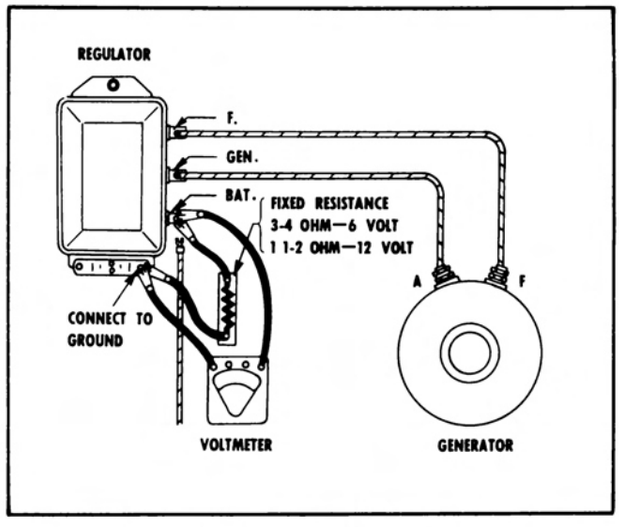


FIGURE 10—*Fixed Resistance Method of Checking Voltage Regulator.*

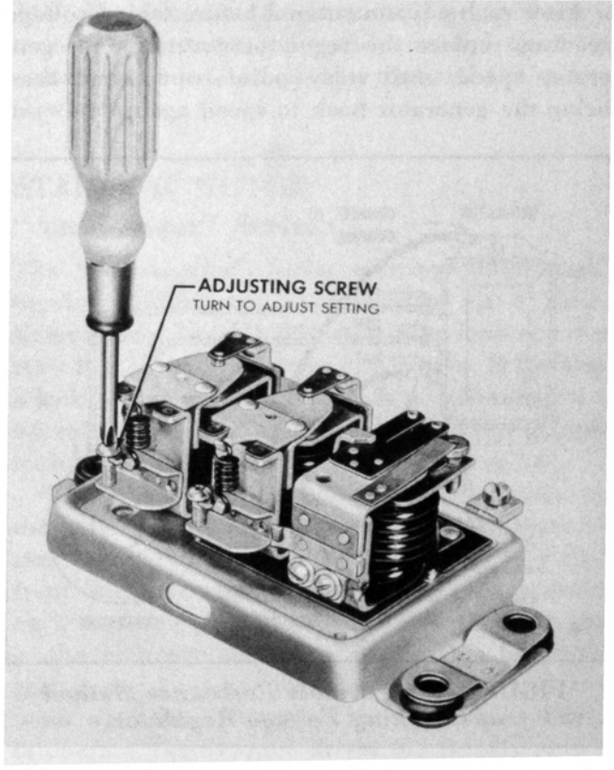


FIGURE 11—*Current and Voltage Adjustment.*

The resistance must be ¾ ohm for six volt units and must be capable of carrying ten amperes without any change of resistance with temperature

changes. With generator operating at a speed at which it would normally produce rated output, and with the regulator at operating temperature (after at least 15 minutes of operation), note the voltage setting. The cover must be in place.

Adjust voltage setting by turning the adjusting screw (Fig. 11). Turn the screw clockwise to increase voltage setting and counterclockwise to decrease voltage setting.

CAUTION: *If adjusting screw is turned down (clockwise) beyond the normal range required for adjustment, the spring support may be bent beyond its elastic limit and fail to return when pressure is relieved. In such a case, turn the screw counterclockwise until sufficient clearance develops between the screw head and the spring support, then bend spring support upward carefully with small pliers until contact is made with the screw head. The final setting of the unit should always be approached by increasing the spring tension; never by reducing it. In other words, if the setting is found to be too high, the unit should be adjusted below the required value and then raised to the exact setting by increasing the spring tension.*

After each adjustment and before taking voltage reading, replace the regulator cover, reduce generator speed until relay points open, and then bring the generator back to speed again.

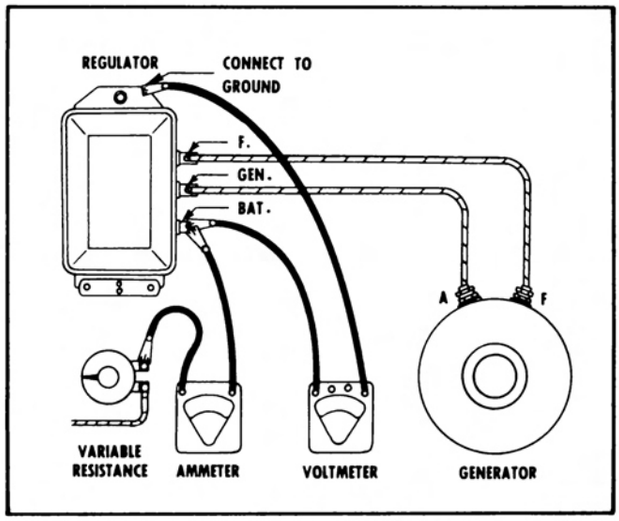


FIGURE 12—*Variable Resistance Method of Checking Voltage Regulator.*

Variable Resistance Method

Connect ammeter into charging circuit at the "BAT" terminal in series with a ¼ ohm variable resistance, and connect voltmeter from this terminal to ground as shown in Figure 12.

Increase the generator speed to where it would normally produce rated output. If less than eight amperes is obtained, turn on lights to permit increased generator output. Cut in resistance until output is reduced to 8-10 amperes. Operate until regulator reaches operating temperature. Retard generator speed until relay points open and then bring generator back to speed and note voltage setting. Voltage reading must be taken with regulator at operating temperature and with 8 to 10 amperes flowing. Cover must be in place.

Adjust regulator as previously outlined. In using the variable resistance method, it is necessary to readjust the variable resistance after each voltage adjustment, and then reduce and increase generator speed before taking the voltage reading.

Current Regulator Checks and Adjustments

Two checks and adjustments are required on the current regulator, air gap, and current setting. The air gap on the current regulator is checked and adjusted in exactly the same manner as for the voltage regulator.

Current Setting

To check the current regulator setting, the voltage regulator must be prevented from operating. Three methods of preventing voltage regulator operation are available. Regardless of the method used, an ammeter must be connected into the charging circuit at the regulator "BAT" terminal (Fig. 13). The three methods are as follows:

1. Jumper Lead Method

Remove the regulator cover and connect a jumper lead across the voltage regulator contact points (Fig. 13). Turn on lights and accessories to prevent high voltage during the test.

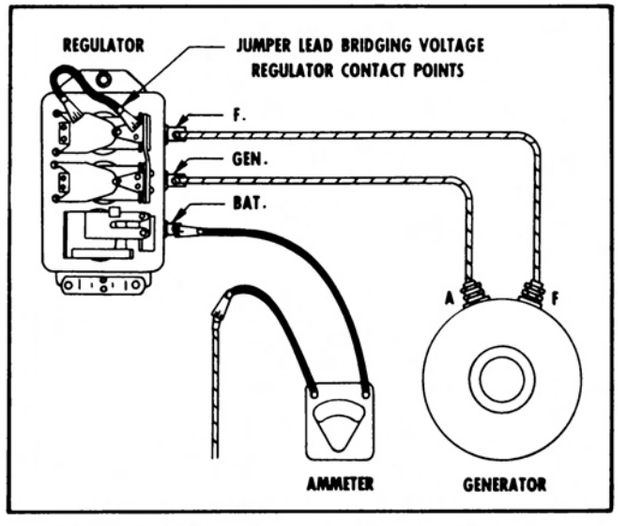


FIGURE 13—*Ammeter Connections for Checking Current Setting.*

With generator operating at medium speed, and with regulator at operating temperature, note the current setting. Adjust by turning adjusting screw clockwise to increase the current setting or counterclockwise to decrease the setting (Fig. 11). See caution note under Voltage Setting of Voltage Regulator.

2. Battery Discharge Method

Partly discharge battery by cranking the engine for 30 seconds with ignition turned off. Never use cranking motor more than 30 seconds since this would overheat and damage it. Immediately after cranking, start engine, turn on lights, and accessories and note current setting with engine operating at medium speed.

3. Load Method

If a load approximating the current regulator setting is placed across the battery during the time that the current regulator setting is being checked, the voltage will not increase sufficiently to cause the voltage regulator to operate. This load may be provided by a carbon pile or a bank of lights.

SUMMARY ON REGULATOR PERFORMANCE AND CHECKS

The voltage regulator unit limits the voltage of the circuit, thus protecting the battery, distributor points, lights, and other accessories from high voltage.

The current regulator unit provides protection to the generator preventing it from exceeding its maximum rated output.

Never set the current regulator above the maximum specified output of the generator.

Many of the regulators are designed to be used with a positive grounded battery only, while others are designed to be used with a negative grounded battery only. Never attempt to use the wrong polarity regulator on application.

The majority of reported regulator troubles arise from dirty and oxidized contact points which cause a reduced generator output. Clean the contact points with a spoon or riffler file as explained previously. NEVER USE EMERY CLOTH OR SANDPAPER TO CLEAN POINTS.

Always make sure that the rubber gasket is in place between the cover and base before replacing the cover. The gasket prevents entrance of moisture, dust, and oil vapors which might damage the regulator.

Proper testing equipment in the hands of a qualified mechanic is necessary to assure proper and accurate regulator settings. Any attempt on the part of untrained personnel to adjust regulators is apt to lead to serious damage to the electrical equipment and should be discouraged.

After any generator or regulator tests or adjustments, the generator must be repolarized as explained previously in order to avoid damage to the equipment.

Reversed Polarity

If the polarity of the generator is reversed, the cut-out relay contact points will vibrate and burn. To make sure the generator has the correct polarity, after reconnecting regulator, momentarily connect a jumper lead between the "GEN" and "BAT" terminals BEFORE STARTING THE ENGINE. The momentary surge of battery current to the generator will correctly polarize the generator.

Radio By-Pass Condensers

The installation of radio by-pass condensers on the field terminal of the regulator or generator will cause the current and voltage regulator contacts to oxidize. Oxidized points cause a high resistance and may result in a low charging rate and a discharged battery. DO NOT CONNECT RADIO BY-PASS CONDENSERS TO THE FIELD TERMINAL OF THE REGULATOR OR GENERATOR. If a condenser has been installed on the field terminal, disconnect the condenser and clean the contact points of both the current and the voltage regulator.

STARTING MOTORS

"Ambassador" Series

The "Ambassador" Series starting motor (with regular transmission or overdrive) is a Delco-Remy Model No. 1107950 with a no-load speed of 6000 R.P.M. at 60 amperes at 5.0 volts. It develops a lock torque of 16 foot pounds at 600 amperes at 6.0 volts. It is a four pole, four brush unit equipped with the Bendix inboard type drive (Fig. 14).

When the circuit between the starting motor and the battery is closed for starting, the armature begins to revolve in a clockwise direction as viewed from the drive end. The Bendix gear is mounted on a threaded sleeve which turns within the gear as the armature begins to rotate. This forces the gear endwise along the armature shaft and into mesh with the flywheel. When the engine begins to operate, the flywheel drives the Bendix gear at a higher speed than the threaded sleeve. This causes the gear to return on the sleeve thread automatically disengaging the gear from the flywheel. The spiral should be kept free from grease and dirt.

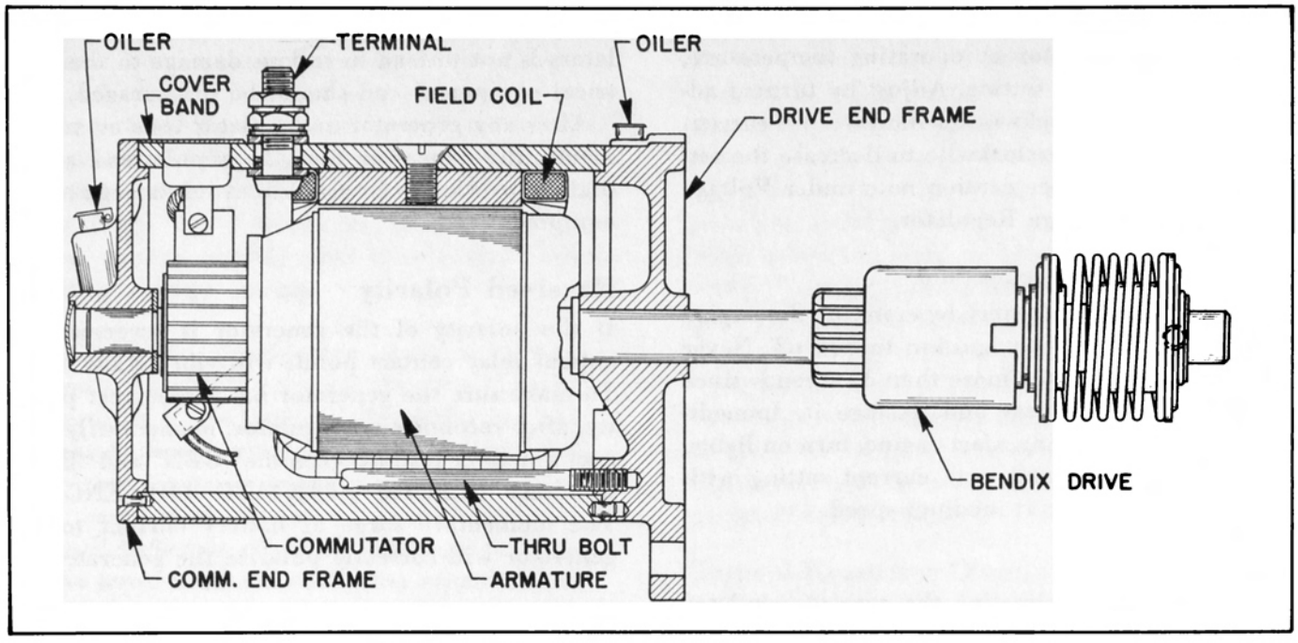


FIGURE 14—*"Ambassador" Series Starting Motor (Regular Transmission or Overdrive).*

The "Ambassador" Series starting motor (with regular transmission or overdrive) is lubricated by hinge cap oilers located at either end of the motor housing. Every 5000 miles these oilers should be given eight to ten drops of light engine oil.

The "Ambassador" Series starting motor (with automatic transmission) Delco-Remy Model No. 1107965 has a no-load speed of 5500 (Min.) R.P.M. at 80 amperes and 5.7 volts. It develops a lock torque of 14 foot pounds at 600 amperes and 3.0 volts (Fig. 15).

The starting motor is a four brush, four pole unit with an over-running clutch type drive linked to a solenoid switch mounted on the motor frame.

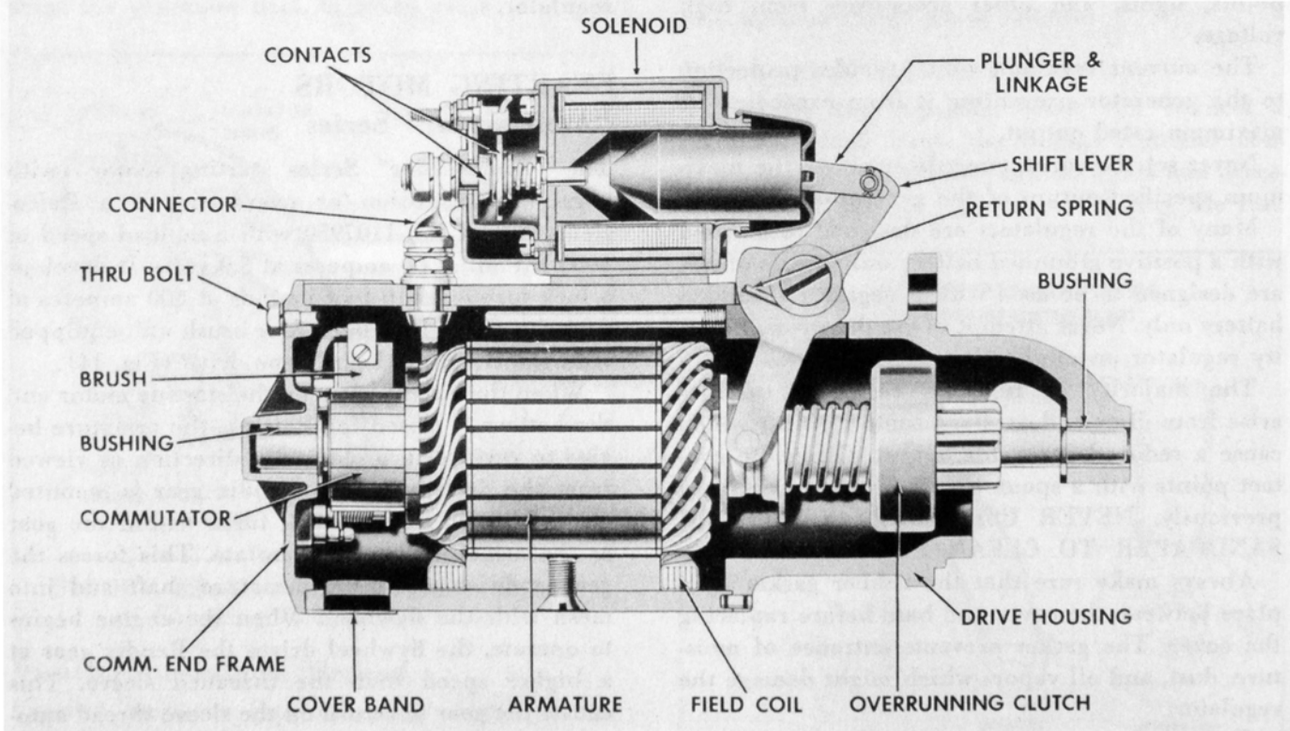


FIGURE 15—*"Ambassador" Series Starting Motor (With Automatic Transmission).*

The solenoid switch closes the battery to starter motor circuit upon completion of engagement of the clutch pinion with the flywheel.

The current consumption of the solenoid switch at 80°F.

Both Windings 85 to 90 Amperes at 5.0 Volts.

Hold-in Windings 14 to 16 Amperes at 5.0 Volts.

The overrunning clutch, armature, and fields should not be cleaned with grease dissolving materials as this would dissolve the lubricant in the clutch mechanism and would damage the insulation in the armature and field coils.

The "Ambassador" Series starting motor (with automatic transmission) is equipped with oilless (bearing) bushings in both the commutator and drive ends. Whenever the starting motor is disassembled or removed from the engine, the oilless bushings at each end should be supplied with a few drops of light engine oil.

Clutch Pinion Clearance "Ambassador" Series (With Automatic Transmission)

The clearance between the pinion and the housing should be 3/16" when the clutch pinion is in the operating position. After reassembling the starter motor or replacing the solenoid switch, adjustment of this clearance can be made by clamping the motor in a vise and using battery current to hold the solenoid plunger in the "bottomed" position. Disconnect the solenoid to motor lead so that the cranking motor will not operate. Place a piece of 3/16" bar stock or gauge between the pinion and housing. Close the solenoid circuit and push the plunger in by hand. Battery current will hold the plunger in while the pinion clearance is adjusted (Fig. 16). With the solenoid switch mounting screws loosened, pull the solenoid switch away from the shift lever until play is taken out of the lever and clutch mechanism. Do not compress the overrunning clutch spring. Tighten switch mounting screws. Moving the switch toward the lever increases the clearance, and moving the switch away from the lever decreases the clearance.

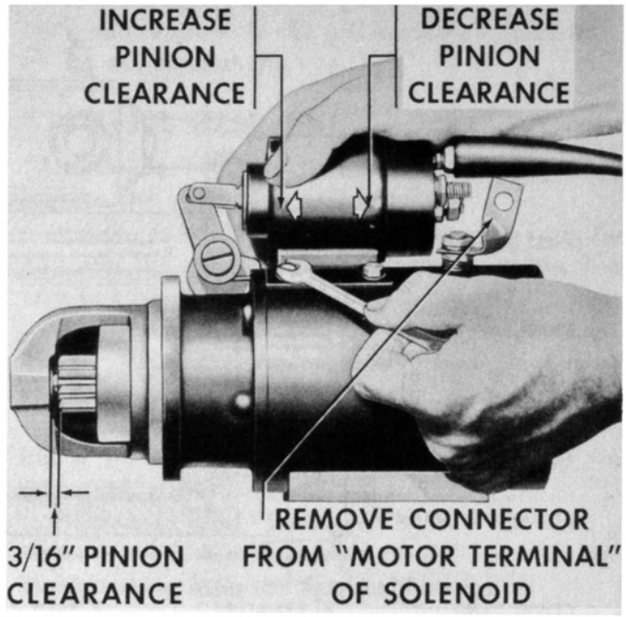


FIGURE 16—*Adjusting Clutch Pinion Clearance.*

STARTING MOTORS

"Statesman" and "Rambler" Series

The "Statesman" and "Rambler" Series starting motors are a Delco-Remy Model 1107119 used with

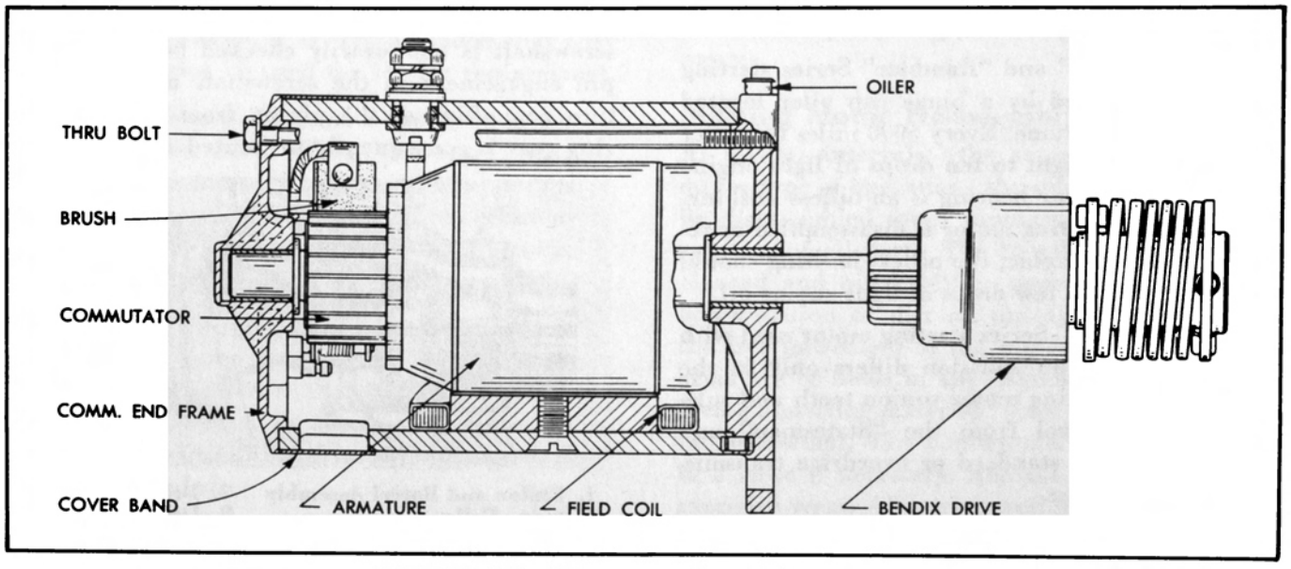


FIGURE 17—*"Statesman" and "Rambler" Series Starting Motor (Regular or Overdrive Transmission).*

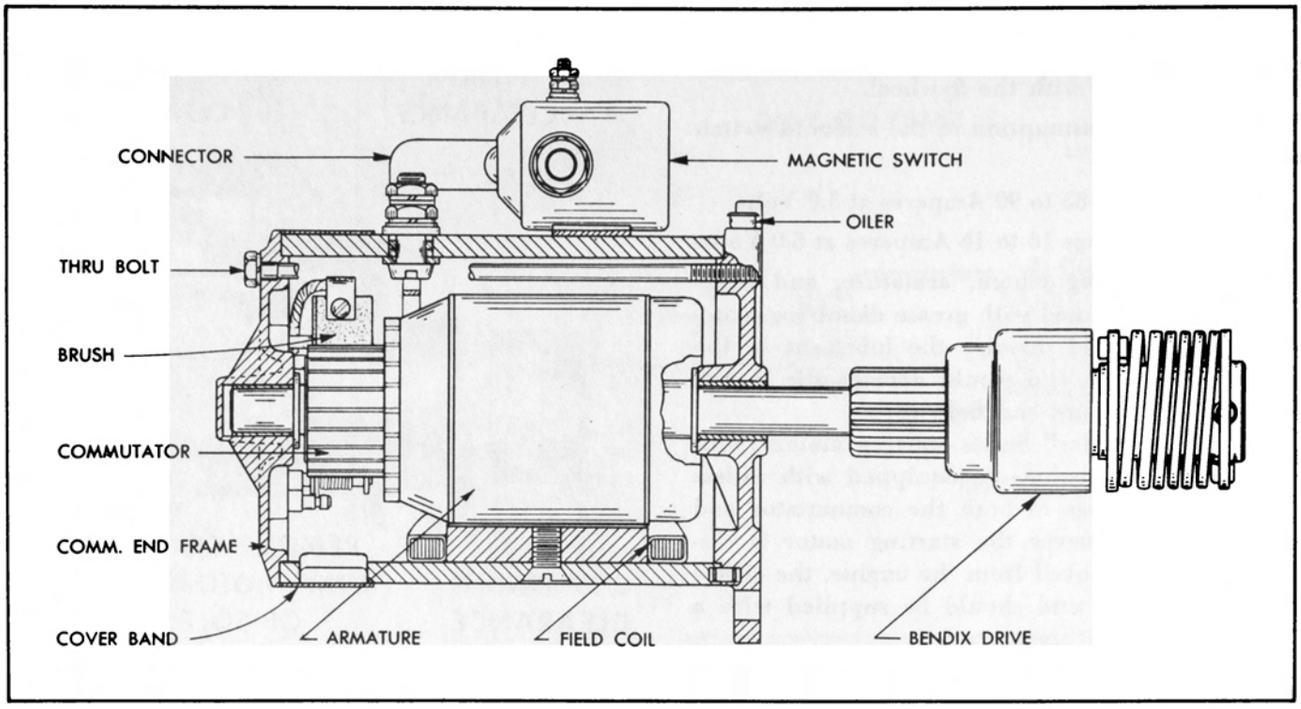


FIGURE 18—*"Statesman" Series Starting Motor (Hydra-Matic).*

the standard and overdrive transmission, and Model 1107121 "Statesman" Series with Hydra-Matic transmission have a no-load speed of 5500 R.P.M. at 70 amperes at 5.65 volts. They develop 12 foot pounds torque at 550 amperes at 3.25 volts. They are four pole, two field, six volt units (Figs. 17 and 18).

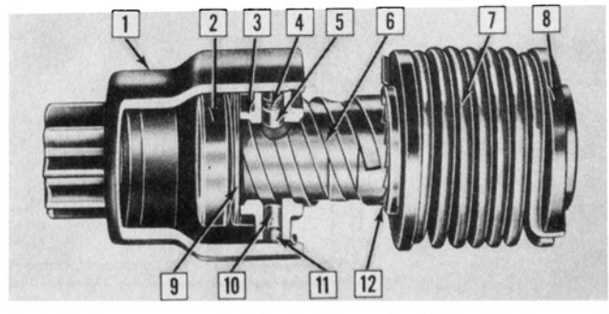
The assembly is mounted on the flywheel housing by a special flange. The armature rotates in a bronze bushing at the commutator end and in pinion housing. Oilless bushings in both the commutator and drive ends support the armature.

The "Statesman" and "Rambler" Series starting motor is lubricated by a hinge cap oiler located on the drive end frame. Every 5000 miles this oiler should be given eight to ten drops of light engine oil. The commutator bearing is an oilless bushing. Whenever the starting motor is disassembled or removed from the engine, the oilless bushing should be supplied with a few drops of light engine oil.

The "Statesman" Series starting motor used with the Hydra-Matic transmission differs only in the length of the starting motor pinion teeth and solenoid switch control from the "Statesman" and "Rambler" Series standard or overdrive transmission starting motor.

The Bendix Folo-Thru type drive, as used on the "Statesman" and "Rambler" Series starting motors, is designed to overcome premature demeshing of the drive pinion from the flywheel ring gear until a predetermined engine speed is reached. Fundamentally, it is similar to other Barrel-Anchor Plate types of Bendix Drives.

Automatic meshing of the drive pinion with the flywheel ring gear is accomplished in the usual manner by closing the starter switch, and the drive then cranks the engine. In the meantime, a spring loaded detent pin, located in the control nut, has dropped into engagement with a notch in the screwshaft. If the engine fails to continue running, due to weak or irregular firing, movement of the control nut in the demeshing direction on the screwshaft is temporarily checked because of the pin engagement in the screwshaft notch. Premature demeshing of the pinion from the flywheel-ring gear is consequently prevented (Fig. 19).



1. Pinion and Barrel Assembly
2. Stop—Collar
3. Control Nut
4. Detent Spring
5. Detent Pin
6. Screw Shaft
7. Drive Spring
8. Drive Head
9. Spring Washer
10. Anti-Drift Pin
11. Drift Pin Spring
12. Dentil Clutch

FIGURE 19—*Bendix Folo-Thru Drive.*

The screwshaft on the FOLO-THRU Drive is divided into two sections with a dentil clutch connection between them. Therefore, when the engine is driving the pinion at a greater speed than the driving effort of the starting motor, the pinion and barrel assembly, control nut, and screwshaft overrun the starting motor armature shaft. This overrunning clutch serves as a safety factor preventing damage to the starting motor.

When the engine does not continue to run and slows down, the speed of the pinion and barrel assembly, control nut, and screwshaft also decreases. Cranking is automatically resumed immediately after the speed of the overrunning parts reaches that of the starting motor armature shaft provided the starter switch has been kept closed.

Intermittent action between overrunning and cranking occurs until the engine is firing so that its speed reaches the predetermined rate at which the detent pin is centrifugally forced against the detent spring, thereby compressing it. The detent pin thus becomes disengaged from the screwshaft notch which permits the drive pinion to automatically demesh from the flywheel ring gear.

Drifting of the pinion and barrel assembly towards the flywheel ring gear while the engine is running is prevented by a spring loaded anti-drift pin which engages a slope on the screwshaft. This anti-drift pin, also assembled in the control nut, is identical in design to the detent pin. However, due to the difference in function, the spring tension is not the same. In general, the anti-drift spring is stronger than the detent spring.

The Bendix Folo-Thru Drive should be cleaned and oiled with a penetrating oil, as any accumulation of dirt on the drive might restrict the free movement of the pinion.

Due to the design, it is recommended that only a complete drive be used for service replacement.

NOTE: *Do not disassemble the drive under any circumstance. There are two spring loaded pins in the control nut. These springs have different tensions and must be assembled in their respective locations. Otherwise, the drive cannot operate properly.*

If the pinion and barrel assembly is accidentally rotated manually to the fully extended position on the screwshaft, do not attempt to force it in the reverse direction. Proceed to install the drive even though it is fully extended.

When the engine starts, the detent pin in the control nut is released by centrifugal force. The drive pinion is then automatically demeshed from the flywheel ring gear in the usual manner, and the pinion and barrel assembly returns to the full demeshed position on the screwshaft.

STARTER REMOVAL

"Ambassador" Series: Disconnect the battery. Then remove the air cleaner assembly.

Loosen the parking brake cable housing from the clip and the cable housing bracket from the battery box base.

Remove the voltage and current regulator mounting screws (leave the wires attached) and move the unit to the side for clearance.

Disconnect the starting motor and remove, moving it forward below the carburetor and to the front and upward.

"Statesman" and "Rambler" Series: The starting motor is easily removed forward and upward after disconnecting from the flywheel housing.

STARTING MOTOR MAINTENANCE

Starting motor maintenance may be divided into two sections: normal maintenance required to assure continued operation of the starting motor, and the checking and repair of inoperative units.

Inspection—The cover band should be removed and the commutator and brushes inspected at regular intervals. If the commutator is dirty, it may be cleaned with No. 00 sandpaper. Blow out dust. Never use emery cloth to clean commutator. If the commutator is rough, out of round, or has high mica, it should be turned down on a lathe. The mica should be undercut to a depth of $\frac{1}{32}$ of an inch. Worn brushes should be replaced. If brushes wear rapidly, check for excessive brush spring tension and roughness or high mica on the commutator. Brush spring tension should be from 24 to 28 ounces.

Starting Motor Disassembly

At regular intervals, (the actual time depending on the type of operation) the starting motor should be disassembled for a thorough cleaning and inspection of all parts. The Bendix drive should be cleaned and oiled with a penetrating oil as any accumulation of dirt on the drive might restrict the free movement of the pinion. Never clean the armature or fields in any degreasing tank, or with grease dissolving materials, since these may damage the insulation. The commutator should be trued in a lathe if necessary. Replace all parts showing excessive wear. All wiring and connections should be checked. Rosin flux should be used in making soldered connections. Acid flux must never be used on electrical connections. Submit reassembled unit to NO-LOAD and LOCK tests.

Checking of Improperly Operating Starting Motor

If the cranking motor does not develop rated torque and cranks the engine slowly or not at all, check the battery, battery terminals and connections, and battery cables. Corroded, frayed, or broken cables should be replaced and loose or dirty connections corrected. The starting motor switch should be checked for burned contacts and the switch contacts cleaned or replaced if necessary.

If all these are in order, remove the cover band of the starting motor and inspect the brushes and commutator. The brushes should form good contact with the correct brush spring tension. A dirty commutator can be cleaned with a strip of No. 00 sandpaper held against the commutator with a stick while the cranking motor operates. NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR. If the commutator is very dirty, or burned, or has high mica, remove the armature from the cranking motor and take a cut off the commutator in a lathe. The mica should be undercut to a depth of $\frac{1}{32}$".

If there are burned bars on the commutator, it may indicate open circuited armature coils which will prevent proper cranking. Inspect the soldered connections at the commutator riser bars. An open armature will show excessive arcing at the commutator bar which is open on the no-load test.

Tight or dirty bearings will reduce armature speed or prevent the armature from turning. A worn bearing, bent shaft, or loose field pole screws will allow the armature to drag on the pole shoes causing slow speed or failure of the armature to revolve. Check for these conditions.

If the brushes, brush spring tension, and commutator appear in good condition, the battery and external circuit found satisfactory, and the starting motor still does not operate correctly, it will be necessary to remove the starting motor for no-load and torque checks.

No-Load Test

Connect the starting motor in series with a battery of the specified voltage and an ammeter capable of reading several hundred amperes. If an R.P.M. indicator is available, read the armature R.P.M. in addition to the current draw.

Torque Test

It is advisable to use a high current carrying variable resistance in the circuit so that the specified voltage at the motor can be obtained. A small variation of the voltage will produce a marked difference in the torque developed.

Interpreting Results of No-Load and Torque Tests

1. Rated torque, current draw, and no-load speed indicates normal condition of starting motor.
2. Low free speed and high current draw with low developed torque may result from:

   Tight, dirty, or worn bearings, bent armature shaft, or loose field pole screws which would allow the armature to drag.

   Shorted armature. Check armature further on growler.

   A grounded armature or field. Check by raising the grounded brushes and insulating them from the commutator with cardboard and then checking with a test lamp between the insulated terminal and frame. If test lamp lights, raise other brushes from commutator and check fields and commutator separately to determine whether it is the fields or armature that is grounded.
3. Failure to operate with high current draw:

   A direct ground in the switch, terminal, or fields.

   Frozen shaft bearings which prevent the armature from turning.
4. Failure to operate with no current draw:

   Open field circuit. Inspect internal connections, and trace circuit with a test lamp.

   Open armature coils. Inspect the commutator for badly burned bars. Running free speed, an open armature will show excessive arcing at the commutator bar which is open.

   Broken or weakened brush springs, worn brushes, high mica on the commutator, or other causes which would prevent good contact between the brushes and commutator. Any of these conditions will cause burned commutator bars.
5. Low no-load speed with low torque and low current draw indicates:

   An open field winding. Raise and insulate ungrounded brushes from commutator and check fields with test lamp.

   High internal resistance due to poor connections, defective leads, dirty commutator, and causes listed under 4 above.
6. High free speed with low developed torque and high current draw indicates shorted fields. There is no easy way to detect shorted fields since the field resistance is already low. If shorted fields are suspected, replace the fields and check for improvement in performance.

IGNITION SYSTEM

The ignition system consists of the ignition coil, condenser, distributor, high tension wiring, spark plugs, ignition switch, and a source of electrical energy—the battery or generator. There are two

circuits in the ignition system. The primary circuit includes the source of electrical energy, the distributor contact points, the condenser, and the primary winding of the ignition coil. The secondary circuit includes the secondary winding of the ignition coil, the rotor, distributor cap, the high tension wiring, and spark plugs.

The primary circuit is completed and broken by the circuit breaker mechanism of the distributor causing a build-up and collapse of a magnetic field in the ignition coil. The condenser is connected across the distributor contact points. When the points open, the current tries to continue flowing. Without the condenser, the current would form an arc across the separating points. The condenser prevents this because it has the ability or capacity to store up electrical energy. The current instead of forming an arc, flows into the condenser. Therefore, the condenser brings the current flow to a quick stop. This causes the magnetic field in the coil, sustained by the current flow, to collapse quickly. It is this quick collapse of the magnetic field which induces the high voltage in the secondary coil windings. The high voltage is distributed to the correct cylinder spark plug wire by means of the rotor and distributor cap.

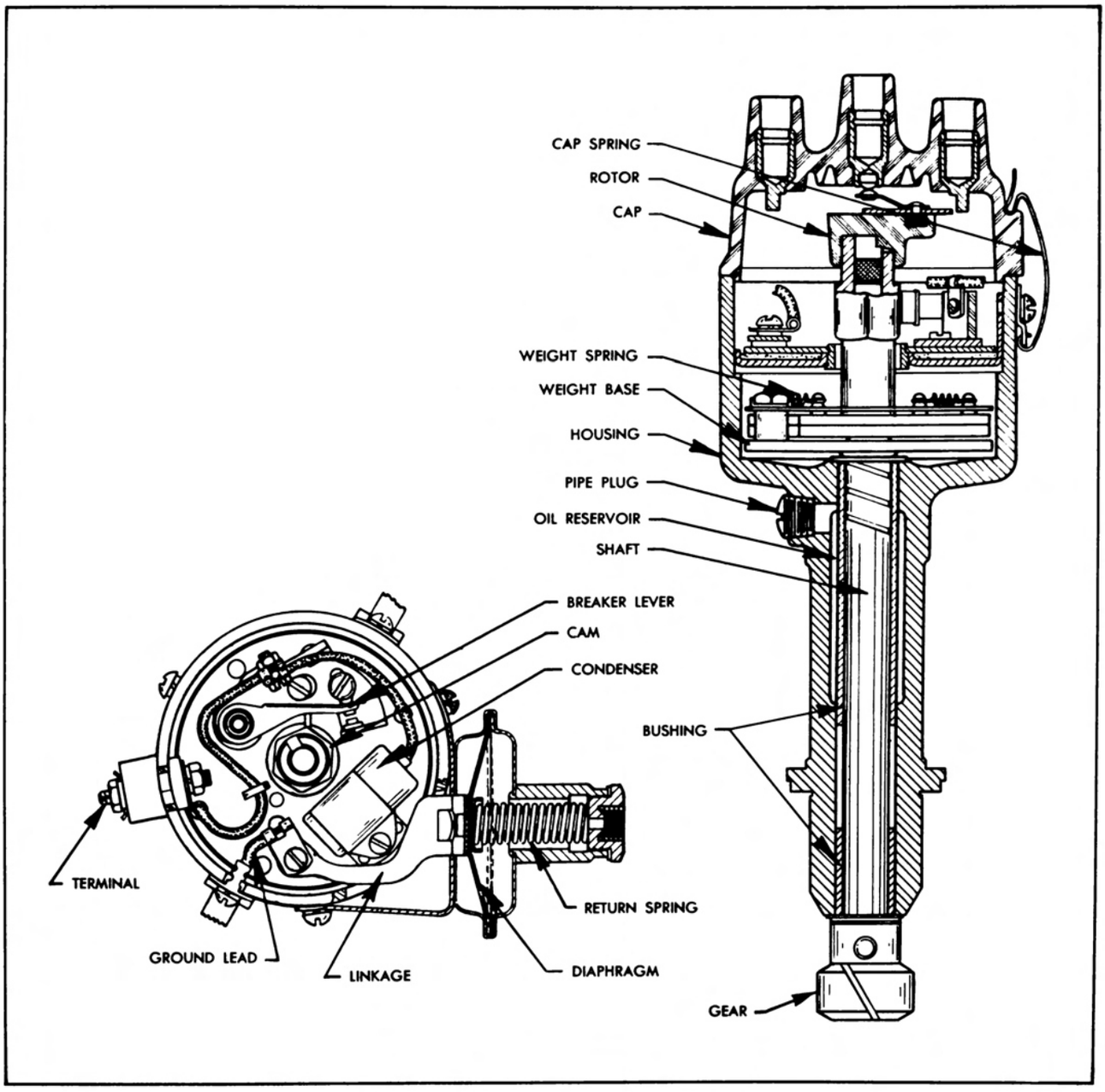


FIGURE 20—*"Ambassador" Series Distributor.*

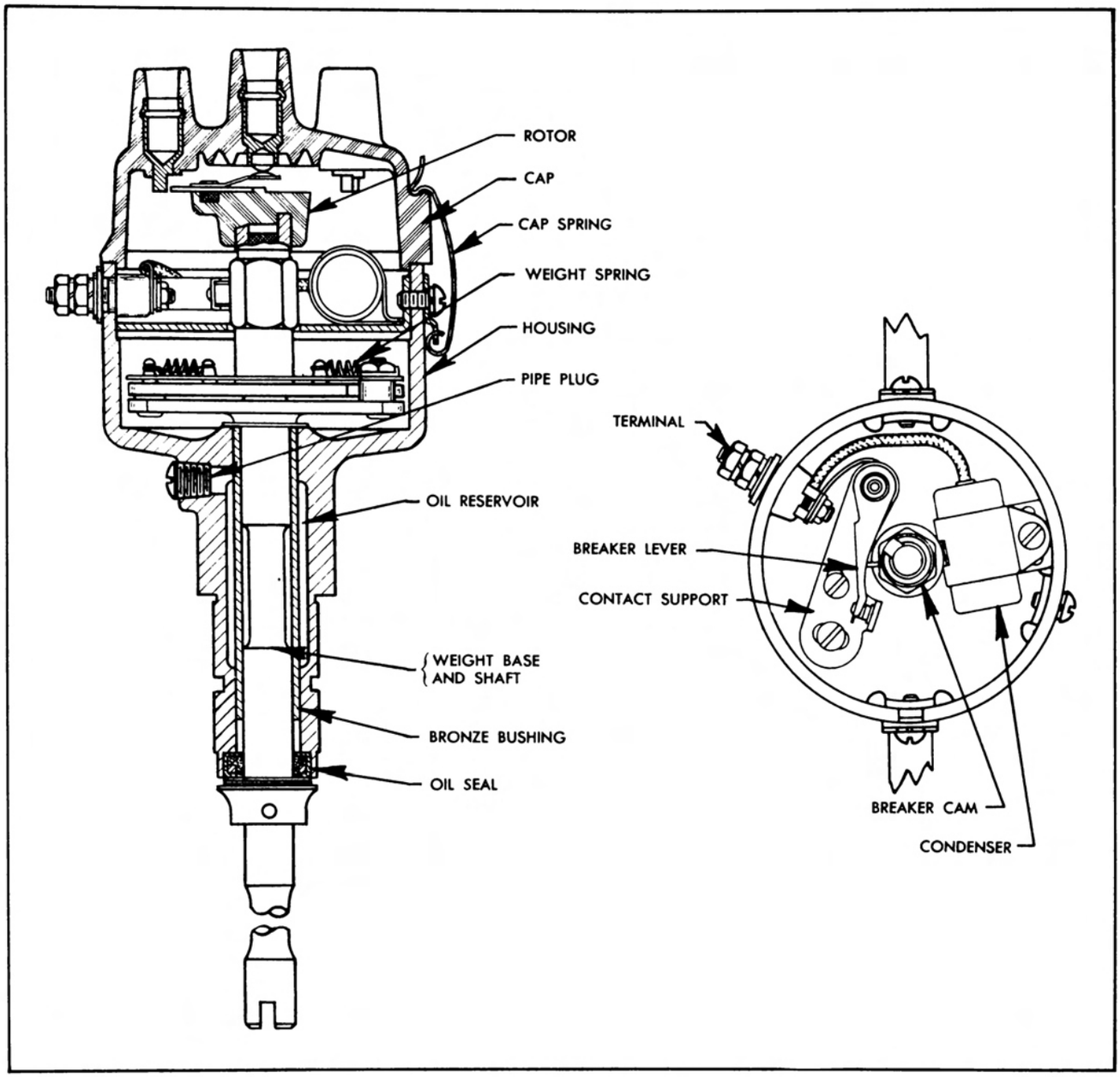


FIGURE 21—*"Statesman" and "Rambler" Series Distributor.*

DISTRIBUTOR

"Ambassador" Series

The "Ambassador" Series distributor, Delco-Remy Model 1110227, is a six volt, six cylinder, vacuum-automatic unit with centrifugal advance of 30 engine degrees (Fig. 20). The shaft revolves in a special porous bushing which spans an oil reservoir in the distributor housing. The vacuum control assembly, Model 1116044, is linked to the breaker plate and controls the rotation of the plate to give a vacuum advance of 12 engine degrees. The breaker plate rests on three bakelized supports which also serve as bearings on which the plate rotates. The breaker plate is secured to the support plate by means of retainer washers on the breaker plate hub and by a bearing washer, spring washer, shim, and stop washer on the retainer post extending through the bottom of the support plate.

"Statesman" and "Rambler" Series

The "Statesman" and "Rambler" Series distributor, Delco-Remy Model 1112382, is a six volt, six cylinder, full automatic unit with centrifugal advance of 24 engine degrees. The shaft revolves in a special porous bushing which spans an oil reservoir in the distributor housing (Fig. 21).

ELECTRICAL SECTION

DISTRIBUTOR SPECIFICATIONS

"Ambassador" Series

Make	Delco-Remy
Model	1110227
Rotation	Counterclockwise at Drive End
Cam Angle	31 to 37 Degrees
Contact Point Pressure	17 to 21 Ounces
Contact Point Opening	.022"
Condenser Capacity	.18 to .23 Mfd.
Automatic Advance	Start at 2.0 Engine Degrees at 600 Engine R.P.M.
	Intermediate—16 Engine Degrees at 1300 Engine R.P.M.
	Maximum 30.0 Engine Degrees at 2700 Engine R.P.M.
	NOTE: Low Limit—4 Degrees Less
Vacuum Advance	4 to 6 inches Vacuum to Start Travel
	14 to 16 Inches Vacuum for 12 Degrees Engine Advance ($\frac{7}{64}$" Travel)

"Statesman" and "Rambler" Series

Make	Delco-Remy
Model	1112382
Rotation	Clockwise at Drive End
Cam Angle	31 to 37 Degrees
Contact Point Pressure	17 to 21 Ounces
Contact Point Opening	.022"
Condenser Capacity	.18 to .23 Mfd.
Automatic Advance	Start at 2.0 Engine Degrees at 600 Engine R.P.M.
	Intermediate—11 Engine Degrees at 800 Engine R.P.M.
	Maximum 24.0 Engine Degrees at 2800 Engine R.P.M.
	NOTE: Low Limit—4 Degrees Less
Vacuum Advance	
Make	Delco-Remy
Model	1116045
Advance	3 to 5 Inches Vacuum to Start Travel
	13 to 17 Inches Vacuum for 17 Degrees Engine Advance ($\frac{23}{64}$" Travel)

Spark Control

Advancing and retarding of the spark for varying conditions of speed and load is accomplished by a centrifugal advance mechanism (governor weights) on the distributor shaft which advances the contact breaker cam and a vacuum control mechanism which, actuated by the manifold vacuum, either rotates the distributor in its mounting or rotates a movable breaker point plate.

Centrifugal Control

With speed variations, it is desirable to advance the spark in direct relation to the engine speed in order to develop maximum power (Fig. 22).

As engine speed increases, the weights gradually throw out and advance the cam assembly to give the desired spark advance for the speed at which the engine is running. The correct centrifugal spark advance is determined by various specified throttle tests until the maximum is obtained. Weight, cam contour, and spring calibration, which permits this advance, may then be corrected by adjustment or replacement.

Vacuum Control

Under part throttle operation, additional spark advance is desirable for improved performance and fuel economy. The vacuum control (Fig. 23) consists essentially of a diaphragm and linkage acting against a return spring. The linkage is riveted to the diaphragm at one end and clamped about the distributor stem at the other end. The vacuum tube from the vacuum control enters the carburetor just above the throttle. As soon as the throttle is opened,

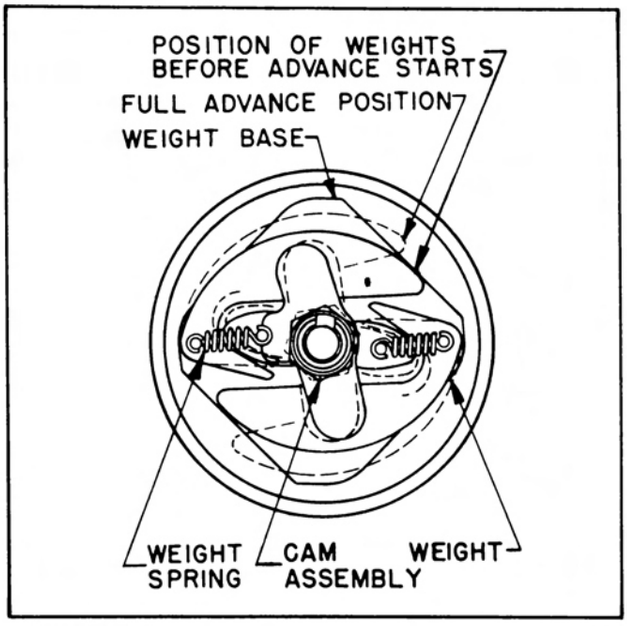


FIGURE 22—*Centrifugal Advance Mechanism.*

the manifold vacuum is admitted to the carburetor and the vacuum control diaphragm is caused to collapse in proportion to the vacuum. The linkage between the diaphragm and the distributor stem is drawn into the vacuum units causing the distributor to rotate in its mounting to secure vacuum advance.

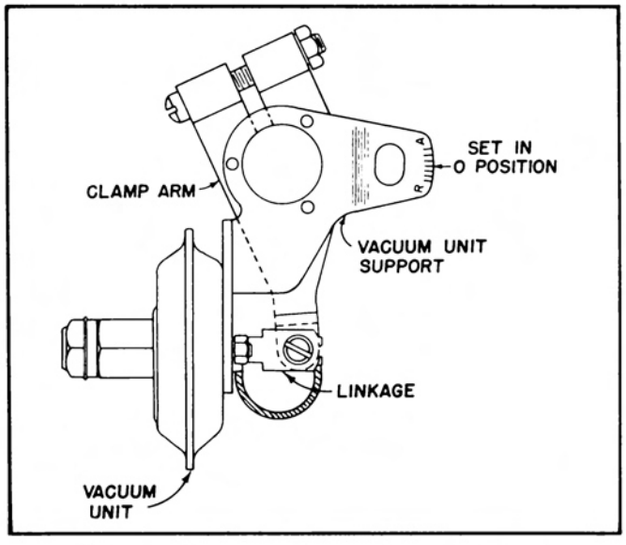


FIGURE 23—*Distributor Vacuum Control "Statesman" and "Rambler" Series.*

The total spark advance for any condition of engine speed is determined by the two advance mechanisms acting together and depending on the throttle opening and load. When the throttle is closed, there is no vacuum advance, all advance being secured by the centrifugal advance mechanism. The total advance is the sum of the centrifugal plus the vacuum advance. With a wide open throttle, the vacuum drops off and all advance is obtained by the centrifugal advance mechanism.

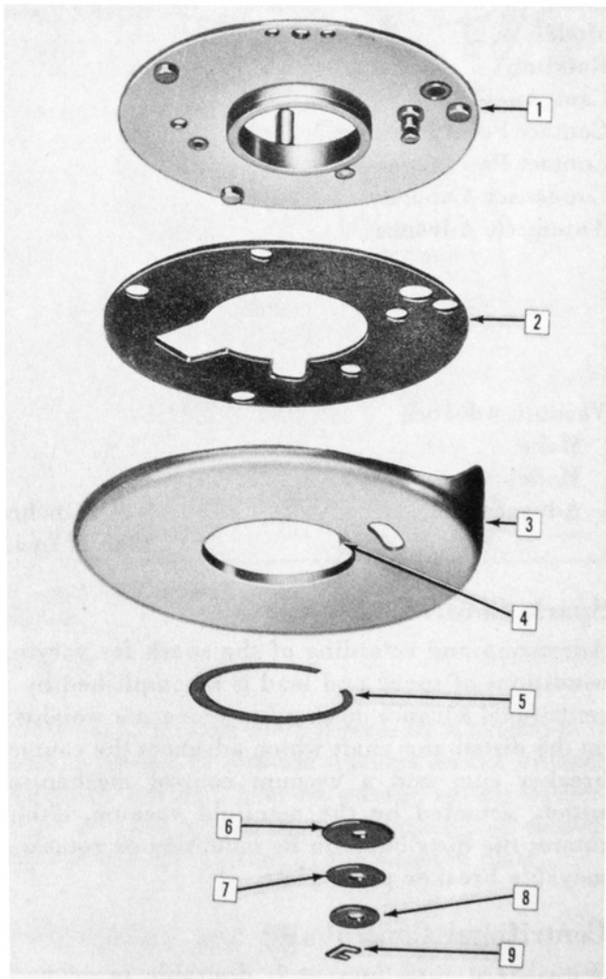
The "Statesman" and "Rambler" Series are equipped with an external vacuum spark control unit which rotates the entire distributor in its mounting pad to the correct advance for the existing vacuum. Its main function is to retard ignition upon quick acceleration or under heavy load operation to prevent ignition ping. The vacuum to actuate this unit is obtained from a port slightly above carburetor throttle butterfly.

The "Ambassador" Series vacuum control differs in its location. It is mounted on the side of the distributor with a connecting link to a movable breaker point plate (mounted on three bakelite bearings) inside the distributor housing.

BREAKER PLATE ASSEMBLY

"Ambassador" Series

The breaker plate rests on three bakelized supports which also serve as bearings on which the plate



1. Movable Breaker Plate
2. Lubricating Felt
3. Support Plate
4. Side Spring
5. Retainer Washer
6. Bearing Washer
7. Spring Washer
8. Shim
9. Stop Washer

FIGURE 24—*Breaker Plate Assembly.*

rotates. The breaker plate is secured to the support plate by means of retainer springs and washers.

If the breaker plate assembly should develop sufficient looseness to permit tipping and rattling in operation, it will be necessary to increase the spring tension by adding one or more shims (Fig. 24) to the post carrying the spring washer. Care must be exercised in making this adjustment, since the pull required to move the breaker plate must be not less than eight ounces or more than 20 ounces (Fig. 25).

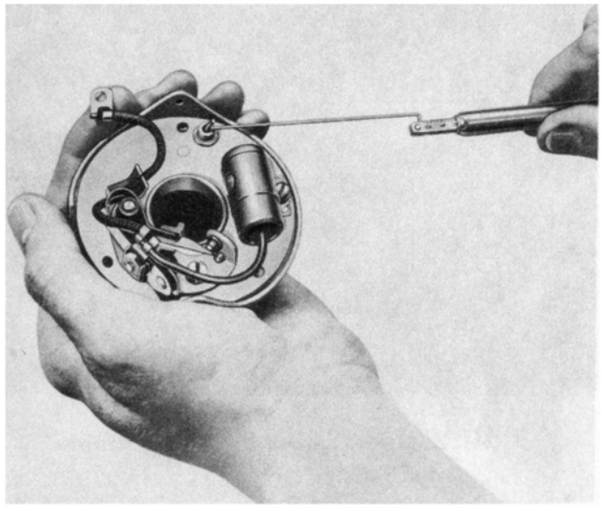


FIGURE 25—*Checking Breaker Plate Looseness.*

The vacuum control linkage must be fitted to the connector bearing on the breaker plate in such a manner that there is no upward or downward thrust on the plate when the vacuum control operates.

When the breaker plate assembly is completely disassembled, it will be necessary to take care that the side spring is not dislodged from its recess in the edge of the center hole in the support plate. This small spring helps to prevent sideplay in the breaker plate assembly and also contributes to the overall tension of the assembly.

The individual breaker and support plates are not serviced separately. It is necessary to replace the breaker plate assembly if either part becomes damaged or worn.

Saturate lubricating felt with light engine oil (No. 10W) at time of overhaul. Avoid excessive lubrication.

DISTRIBUTOR MAINTENANCE

Lubrication

Do not remove pipe plug in distributor oil reservoir. This reservoir back of the shaft bushing is filled with light engine oil and sealed at time of manufacture. The supply of oil is sufficient to last for 10,000 miles of operation under normal conditions. Thus the plug need not be removed oftener than every 10,000 miles for lubrication except when unusual heat or other operating conditions are experienced. Grade SAE No. 20 oil should be added when needed. Seal the plug with sealing compound.

A trace of high melting point ball bearing grease should be placed on the breaker cam every 5,000 miles. At 5,000 miles, put one drop of light engine oil on the breaker lever pivot and a few drops on the felt wick under the rotor.

On the "Ambassador" Series, add three to four drops of light engine oil (No. 10W) to the felt wick between the plates every 5,000 miles. Avoid excessive lubrication.

Inspection

The cap should be removed at regular intervals and the contact points, rotor, and cap examined. Check the high tension wiring for frayed or damaged insulation and poor connections at the cap or plugs. Replace if necessary. Replace the cap or rotor if they are cracked or show carbonized paths indicating the secondary current is leaking to ground over the surface of the material.

CONTACT POINTS—Points that are burned or pitted should be replaced or dressed with a clean, fine-cut contact file. The file should not be used on other metals and should not be allowed to become greasy or dirty. NEVER USE EMERY CLOTH TO CLEAN CONTACT POINTS. Contact surfaces, after considerable use, may not appear bright and smooth but this is not necessarily an indication that they are not functioning satisfactorily.

OXIDIZED CONTACT POINTS—May be caused by high resistance or loose connections in the condenser circuit, oil or foreign materials on the contact surfaces, or most commonly, high voltages. Check for these conditions where burned contacts are experienced.

CONTACT POINT OPENING—The point opening must be set to specifications. Points set too closely burn and pit rapidly. Points with excessive separation cause a weak spark at high speed. The point opening of new points may be checked with a feeler gauge. Use of a feeler gauge on used points is not recommended, since the roughness of used points makes it impossible to set the point opening accurately by this method. A dial indicator is recommended to check the point opening of used points. When necessary to check and adjust point opening with a feeler gauge, proceed as follows:

Rotate the breaker cam until the breaker lever rubbing block is on the high point of the cam lobe

thus giving the maximum point opening. Loosen the clamp screw holding the contact support and adjust point opening by turning the eccentric screw in the contact support. Tighten the clamp screw, check with gauge again after tightening the clamp screw. THE CONTACT POINTS SHOULD BE CLEANED BEFORE ADJUSTING IF THEY HAVE BEEN IN SERVICE. The cam or contact angle is the angle in degrees of cam rotation through which the points remain closed.

CONTACT POINT PRESSURE—The point pressure must fall within the limits given. Weak tension will cause point chatter and ignition miss at high speed, while excessive tension will cause undue wear of the contact points, cam, and rubbing block.

USE OF DISTRIBUTOR TEST FIXTURE—The distributor test fixture accurately checks cam angle, spark advance, and synchronization on distributors removed from the car. It will also show excessive distributor shaft eccentricity as indicated by variation in synchronization.

After a distributor has been repaired, the calibration of the centrifugal automatic mechanism must be checked. Proper engine performance cannot be obtained unless the centrifugal curve is within the limits specified for the particular engine.

CONDENSER—Four factors affect condenser performance and each factor must be considered in making any condenser tests. BREAKDOWN is a failure of the insulating material, a direct short between the metallic elements of the condenser. This prevents any condenser action. LOW INSULATION RESISTANCE or leakage prevents the condenser from holding a charge. A condenser with low insulation resistance is said to be "weak." All condensers are subject to leakage, which up to a certain limit is not objectionable. When it is considered that the ignition condenser performs its function in approximately 1/12,000 of a second, it can be seen that leakage can be large without detrimental effects. It must be considered, however, in any condenser test. HIGH SERIES resistance is excessive resistance in the condenser circuit due to broken strands in the condenser lead or to defective connections. This will cause burned points and ignition failure upon initial start and at high speeds. CAPACITY is built into the condenser and is determined by the area of the metallic elements and the insulating and impregnating materials. For a complete check of the condenser, it is desirable to use a tester which will check for the above four conditions.

IGNITION TIMING

Timing of the distributor to the engine should be made after the distributor has been calibrated in accordance with specifications. (See Distributor Specifications).

Ignition timing is obtained by firing No. 1 cylinder with the piston on T.D.C. compression stroke.

To facilitate timing, a T.D.C. mark is milled on the outer circumference of the vibration damper pulley. The use of a neon timing light is recommended.

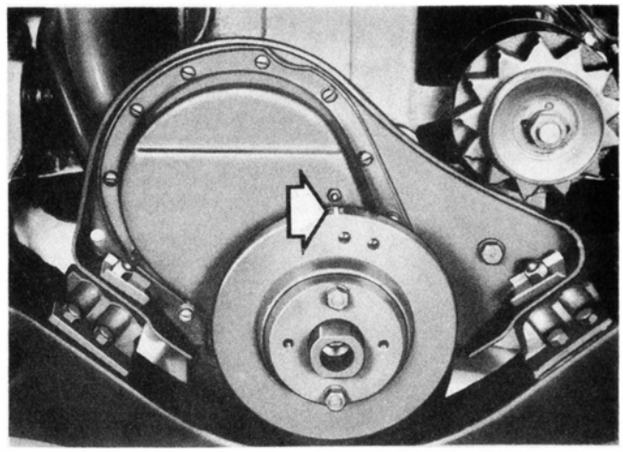


FIGURE 26—*Timing Mark Location.*

Locate No. 1 piston in firing position. Rotate the distributor in its mounting so that the breaker points are just about to separate. The distributor rotor now points to the position of the No. 1 cylinder contact in the distributor cap. Arrange the spark plug wires in the cap to the proper firing order, 1-5-3-6-2-4, with rotor rotation (clockwise on the "Ambassador" Series) and (counter-clockwise in the "Statesman" and "Rambler" Series). Start the engine and time accurately with a neon timing light. Road test car and readjust timing for slight ping, under full power application at twenty miles per hour, level road, third speed operation.

IGNITION COILS

Ignition coils do not require special service other than the keeping of terminals and connections clean and tight. Coils having a resistance unit attached to the primary circuit will not operate if the resistance unit is open circuited. It is necessary to replace the complete coil in case of failure in the windings.

SPARK PLUGS

Type: Auto-lite A-7A—(Optional—Champion J-10 or AC-44)—14MM.

Inspection

The spark plugs should be removed periodically from the engine and examined for burned electrodes and dirty, fouled, cracked, or broken porcelains (Fig. 27).

The gaps should be checked, set, and rechecked with an adjusting tool and gauge (Fig. 28). The recommended gap setting is .030".

CAUTION: *When installing plugs, always use new gaskets. They aid in dissipating heat and also insure compression and power expansion pressure seal.*

Always use a torque wrench when installing spark plugs. Distortion from over tightening will change the gap clearance of the plug. Torque to 30 foot pounds in cast iron cylinder heads.

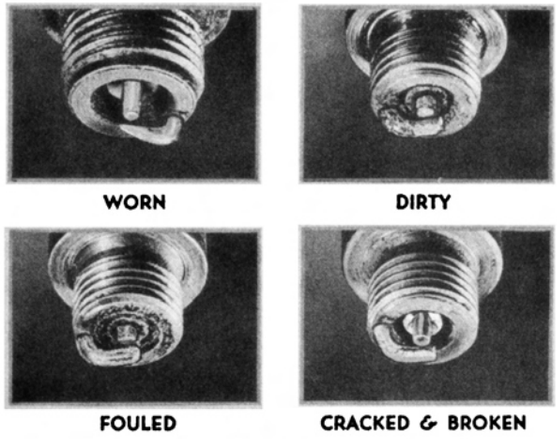


FIGURE 27—*Spark Plugs Often Indicate Other Sources of Trouble.*

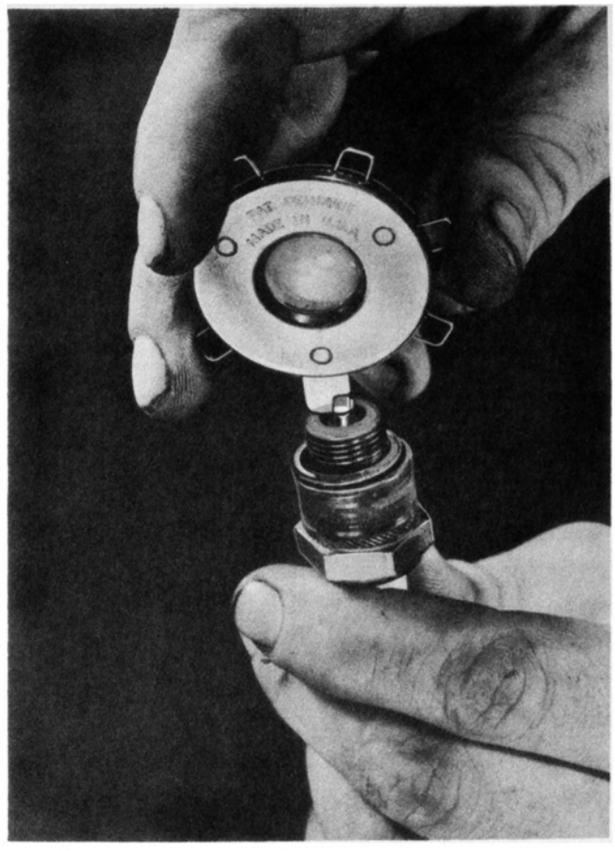


FIGURE 28—*Set Gap to .030".*

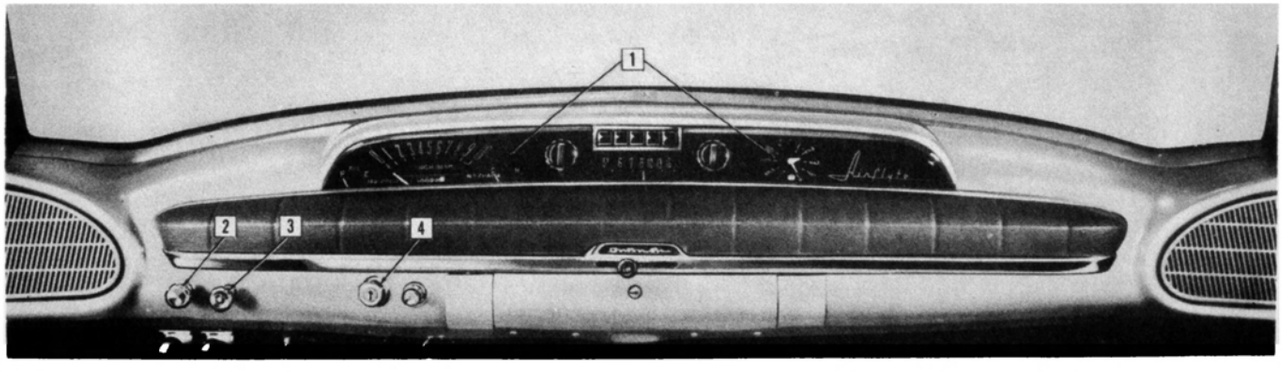
INSTRUMENT CLUSTER

"Ambassador" and "Statesman" Series

The instrument cluster housing is mounted in the center of the dash panel. In addition to the speedometer, it contains the panel lights, high beam indicator light, no charge indicator light, low oil pressure light, electric gauge receiver units for water temperature and fuel level, radio controls and dial, and electric clock mounting.

"Rambler" Series

The instrument cluster assembly contains the speedometer, low oil pressure light, high beam indicator light, no charge indicator light, electric gauge receivers for water temperature, and fuel level indicators.



1. Instrument Cluster Assembly
2. Light Switch
3. Windshield Wiper Control
4. Ignition Switch

FIGURE 29—*Instrument Cluster Assembly and Dash Panel "Ambassador" and "Statesman" Series.*

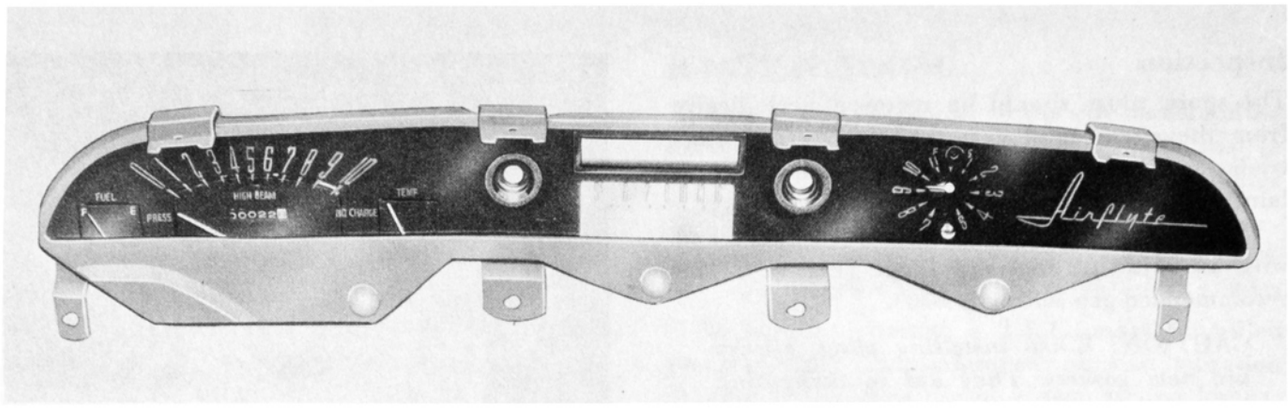


FIGURE 30—*Instrument Cluster Assembly Removed.*

INSTRUMENT LIGHTS

The instrument lights illuminate the faces of the instrument cluster gauges for night driving.

On the "Ambassador" and "Statesman" Series, the main light switch must be in "Park" or "Drive" position before the instrument lights will operate. They are controlled by rotating the switch knob.

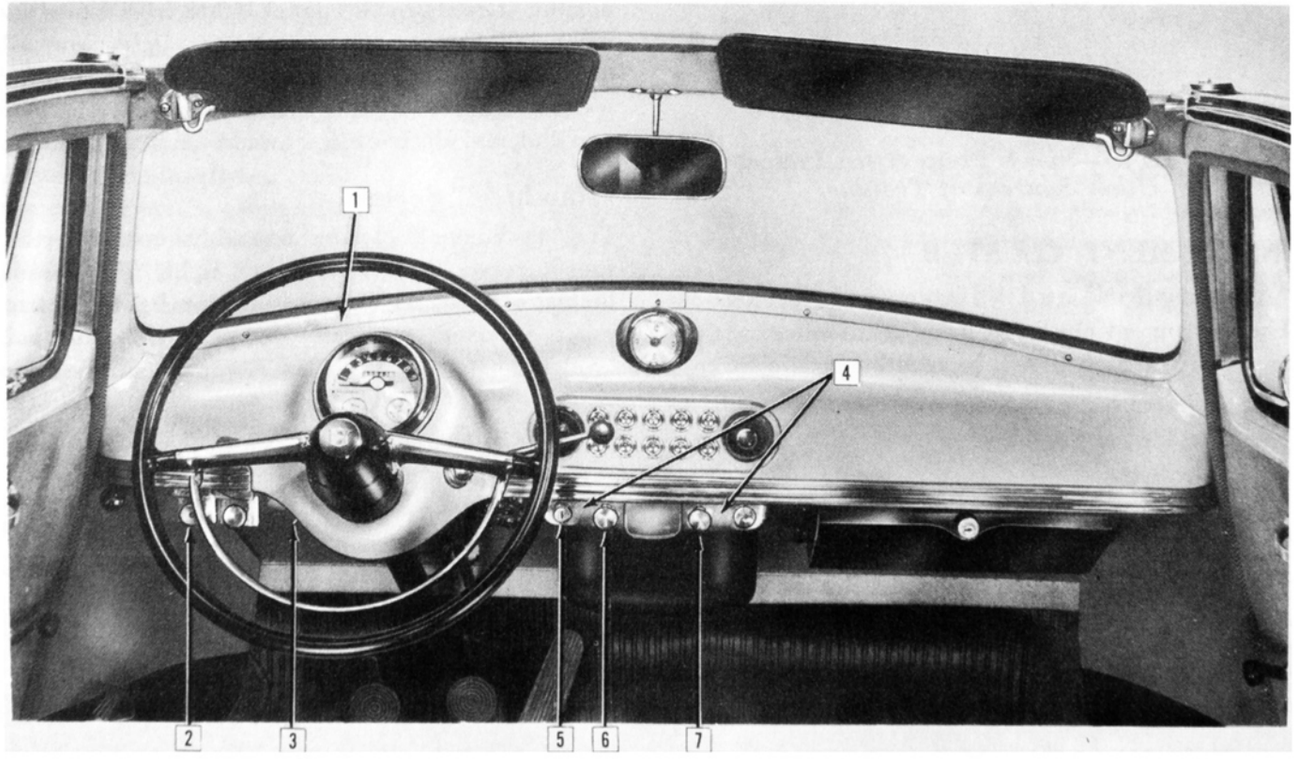
The "Rambler" Series instrument lights are controlled by a toggle switch located on the lower flange of the dash panel to the left of the steering jacket tube.

HIGH BEAM INDICATOR LIGHT

This light is connected to the high beam circuit in the headlight foot or dimmer switch. When the high beam is operating in the head lamps, a red light dot is seen in the speedometer scale below the numeral 5 on the "Ambassador" and "Statesman" Series, and in the lower radius of the instrument cluster on the "Rambler" Series.

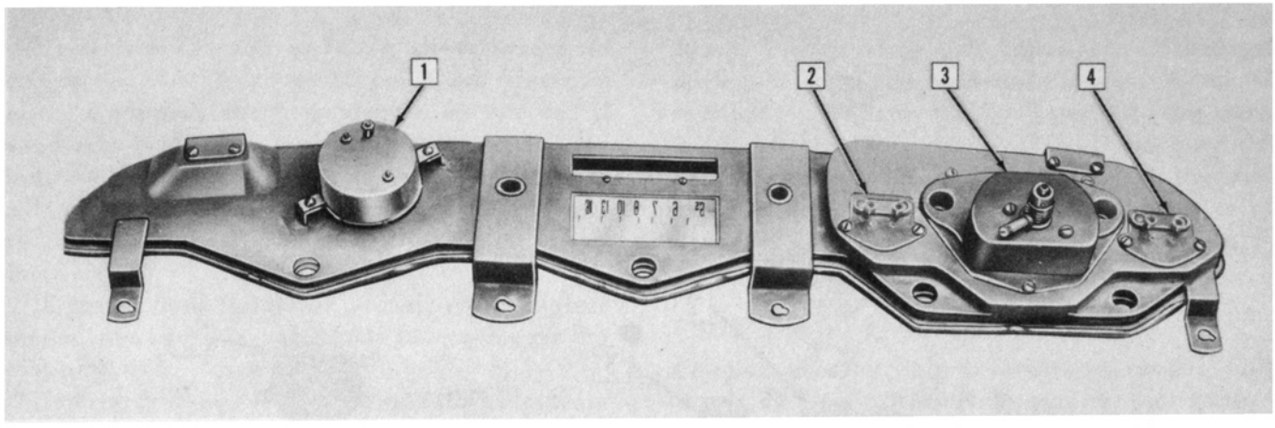
NO CHARGE INDICATOR LIGHT

A light is used to indicate general generator operation. When the output on the generator is below battery potential, a red light dot is seen on the right hand side of the instrument cluster below the



1. Instrument Cluster
2. Windshield Wiper Control
3. Instrument Panel Light Switch
4. Instrument Switch Panel
5. Ignition Switch
6. Light Switch
7. Weather Eye Control Valve

FIGURE 31—*Instrument Cluster Assembly and Dash Panel "Rambler" Series.*



1. Electric Clock
2. Water Temperature Gauge
3. Speedometer
4. Fuel Level Indicator

FIGURE 32—*Instrument Gauge Mounting "Ambassador" and "Statesman" Series.*

"10" of the speedometer scale. When the generator output is above battery potential, other factors (wiring, voltage regulator, etc.) being normal, the light is out. On the "Rambler" Series, the no charge light is in the left side of the instrument cluster.

The charge indicator bulb is in an insulated socket and is connected to the charging circuit obtaining its ground through the voltage regulator. When the generator output rises above battery potential, the current flow from the generator reverses the direction of flow in the charging circuit and the light goes out. At this time, the charge indicator light no longer obtains a ground through the voltage regulator.

ELECTRIC GAUGES

"Ambassador" and "Statesman" Series

The gauge receiver units are of the magnetic type using a variable magnetic field in balanced coils to deflect the indicator needle armatures. The pointers of the needle armatures indicate existing coolant temperature or fuel level. The gauge sending units are located in the cylinder head (temperature) and the fuel tank (fuel level). They are simply rheostats or variable resistors which vary the current flow through each needle deflecting coil causing the needle to indicate accordingly.

These units may be tested but cannot be repaired in the field. When one fails to function properly, it is necessary to replace it. Gauges can be removed separately. Each is held in the cluster plate by two mounting screws.

CAUTION: *Whenever any work is to be performed on the instrument cluster, speedometer, ignition switch or horn blower, disconnect one battery lead at the battery terminal.*

When removing more than one wire in the gauge cluster, label each wire as it is removed. This will insure proper relocation.

Testing Fuel Level and Temperature Indicators

No units should be removed from the car until a check has been completed which shows that such units are damaged or defective.

Obtain a known to be good tank unit. The "Ambassador" and "Statesman" Series requires a "Auto-Lite" variable resistor type. The "Rambler" requires a "King-Seeley" bimetal type.

To determine that the test unit is satisfactory, connect it in series with a known to be good receiver of the same type as the sending unit and a six volt source of current. Operate the tank unit by hand. The receiver must read empty with tank unit float in bottom position, and full with tank float in top position.

Two ten foot lengths of insulated wire equipped with clip terminals at each end will facilitate checking procedure.

Disconnect the sending unit being checked and connect a tank test unit. Turn on ignition switch and operate tank unit by hand.

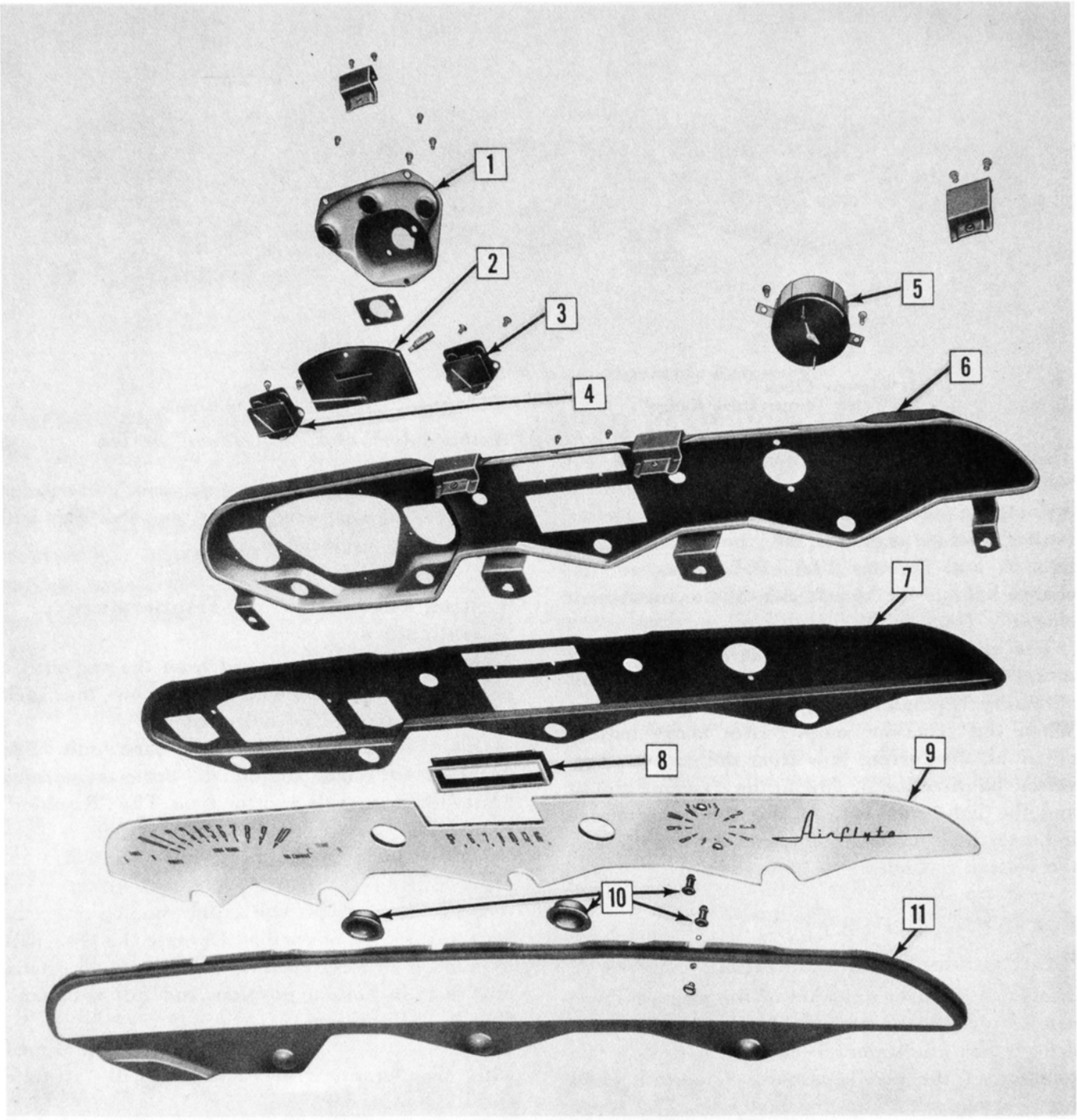
Fuel Level Indicator

With float of tank unit at bottom position, receiver being checked should register at bottom mark on dial. Move float up to top position; receiver being checked should move to top mark on dial. On the "Rambler" Series allow one minute for receiver pointer to come to rest.

Water Temperature Indicator

"Ambassador" and "Statesman" Series

With float of tank unit at bottom position, receiver being checked should register at COLD end



1. Speedometer Housing
2. Speedometer Head
3. Temperature Gauge
4. Fuel Gauge
5. Clock
6. Cluster Housing
7. Lens Backing Plate
8. Radio Push Button Bezel
9. Lens
10. Lens Retaining Eyelets
11. Lens Retainer

FIGURE 33—*Exploded View of Instrument Cluster "Ambassador" and "Statesman" Series.*

of scale. Move float up to top position; receiver being checked should move to HOT end of scale.

"Rambler" Series

With float of tank unit at bottom position, receiver being checked should register at HOT end of scale. Move float up to top position; receiver being checked should move to COLD end of scale. Allow one minute for receiver pointer to come to rest.

All Series (Testing Continued)

If the dash unit needle reads high scale at all times, check for grounded wiring to the sending unit, shorted or burned out sending unit, or reversed wiring on the dash unit. If the dash unit needle reads low scale at all times, check for open circuit to the sending unit, open circuit in the sending unit, or failure of the ignition switch circuit to energize the gauge units.

If receiver operates correctly, check sender on car to see if it is properly grounded. If car is radio equipped, check condenser on sender. If condenser is shorted, it will cause receiver to over indicate. When replacing condenser, it is preferable to use one of .10 microfared capacity, but up to .50 can be used if necessary to cut out radio interference.

If ground and condenser are all right, replace sender and check to see if this has corrected the difficulty.

If receiver does not operate or fails to operate correctly, check wire lead to receiver and replace wire if faulty. If wiring is good, then replace receiver and check with sender on car. If receiver fails to operate, then replace sender.

NOTE: *If necessary to replace the receiver because it has been burned out, check wiring, sender, and radio condenser (if any) for a "short" and correct this condition. Otherwise, new receiver will also burn out. A short in the gauge circuit is easily recognizable because it will cause receiver to over indicate in most cases beyond full scale.*

WARNING: *Do not apply six volts direct to receiver (dash unit) as this will burn it out.*

LOW OIL PRESSURE WARNING LIGHT

The low pressure warning light is wired in series with the oil pressure sending unit on the engine block. This sending unit contains a diaphragm, spring, linkage, and electrical contacts. When the ignition switch is in the "on" position, the warning light circuit is energized and the circuit is completed through the closed contacts in the sending unit. Upon start of the engine, build up of oil pressure will compress the diaphragm opening the contact points, thereby breaking the circuit.

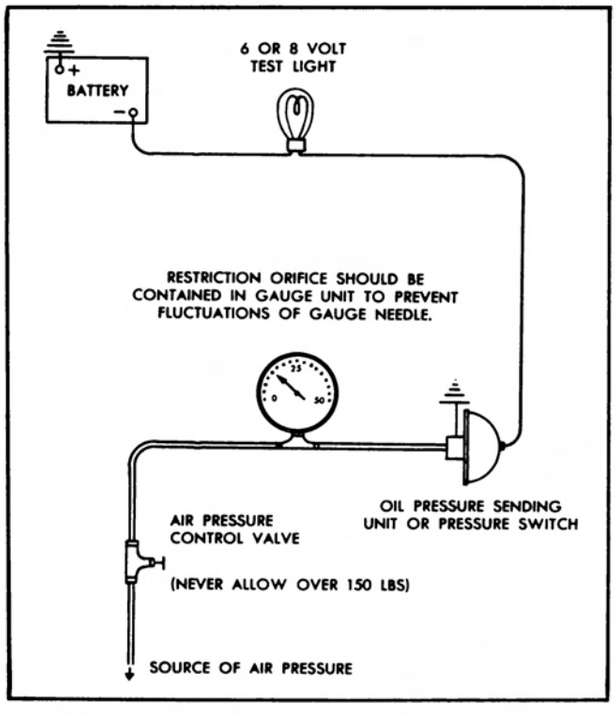


FIGURE 34—*Oil Pressure Warning Light Test Procedure.*

Oil Pressure Unit Test Procedure

Connect indicator bulb in series with sending unit. Apply air or oil pressure to sending unit controlling pressure with a control valve and positive indicating gauge (Fig. 34).

"Ambassador" and "Statesman" Series: With less than 6½ P.S.I., the light will be on. Over 6½ P.S.I., the light will be off. Specifications are subject to a tolerance of plus or minus 1½ P.S.I.

"Rambler" Series: With less than 13 P.S.I., the light will be on. Over 13 P.S.I., the light will be off. Specifications are subject to a tolerance of plus or minus 3 P.S.I.

IGNITION LOCK CYLINDER REMOVAL

"Ambassador" and "Statesman" Series

Remove the left ash tray assembly. Then remove the large switch retaining nut. Enough slack exists in the wiring to the ignition switch to permit lowering the switch assembly so that the ignition lock cylinder can be removed.

The cylinder is held in the housing by a spring loaded horseshoe lock which snaps into a groove cut in the switch housing to retain the cylinder.

Insert a stiff piece of wire (a paper clip will do) into the small hole as illustrated in Figure 35. Turn the key to the extreme left (counterclockwise). With the wire, depress the horseshoe lock in the lock cylinder and pull the lock cylinder from the housing.

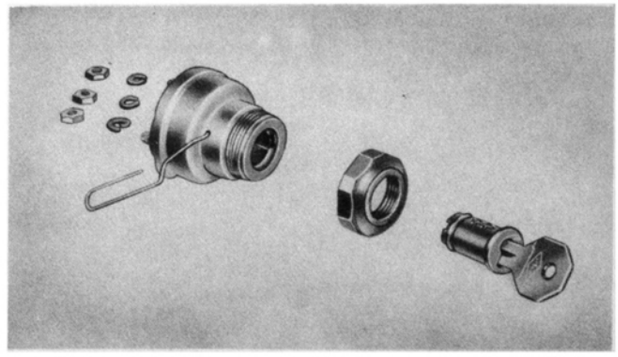
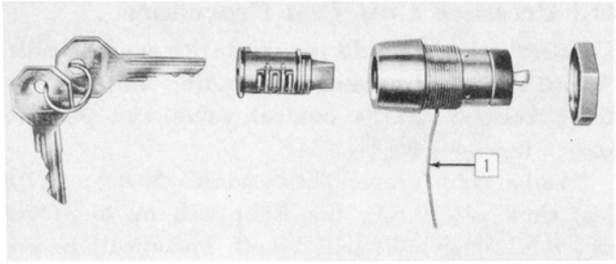


FIGURE 35—*Ignition Switch Assembly "Ambassador" and "Statesman" Series.*

Briggs and Stratton type lock cylinders are used on the "Ambassador" and "Statesman" Series.

"Rambler" Series

Disconnect the ignition switch wires and remove the switch retainer nut located behind the instrument panel. The switch assembly may then be withdrawn from the panel. Insert a stiff wire, or paper clip, through the small hole in the switch housing to depress the small horseshoe lock retaining the lock cylinder (Fig. 36).



1. Use Stiff Wire to Depress Horseshoe Lock

FIGURE 36—*Ignition Switch Assembly "Rambler" Series.*

Yale and Towne lock cylinders are used on all "Rambler" Series.

IGNITION SWITCH REMOVAL

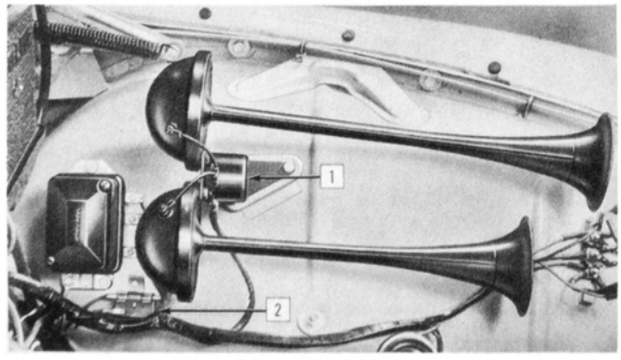
Follow the procedure outlined under Ignition Lock Cylinder Removal.

CAUTION: *Before any work is performed under the dash, the battery should be disconnected from the electrical system.*

CIRCUIT BREAKERS

"Ambassador" and "Statesman" Series

Circuit breakers are provided to protect the main electrical wiring from overload. These consist of 20 ampere circuit breaker (ignition switch, heater motors, and stop light) and one 30 ampere circuit breaker (main lighting circuit). The 20 ampere circuit breaker is located behind the dash panel on the left side of the ceiling of the cowl. The 30 ampere circuit breaker is attached to the headlight switch (Fig. 42).



1. Horn Relay
2. 30 Ampere Fuse

FIGURE 37—*Horn, Relay and Stop Light Fuse Location "Rambler" Series.*

ELECTRICAL FUSE

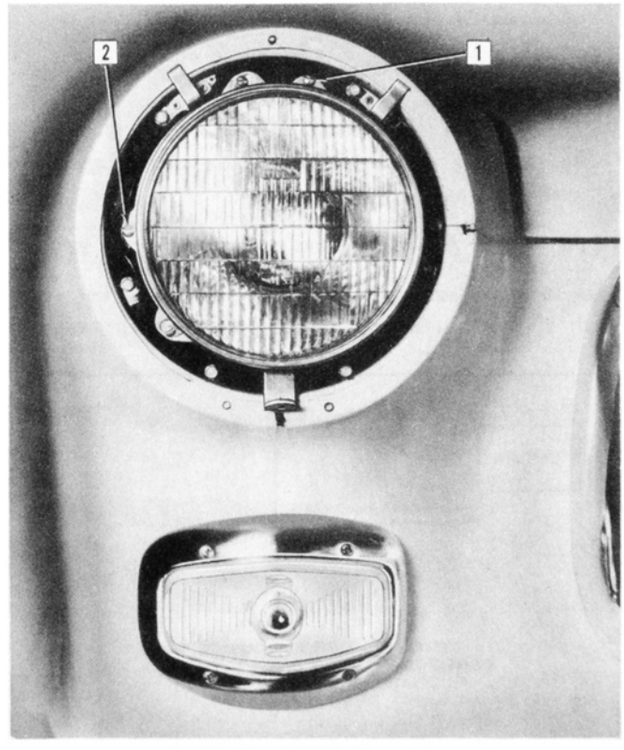
"Rambler" Series

A 30 ampere fuse is provided in the light switch assembly to protect the main lighting circuit from overload (Fig. 43). The stop light and directional signal lights are protected by a 30 ampere fuse located in the left front wheelhouse panel (Fig. 37).

HEAD LAMPS

The head lamps are of the familiar sealed beam type. Adjustment of beam direction may be made to agree with existing state regulations by the method outlined below. For access to the adjustment screws on each sealed beam, it is only necessary to remove the head lamp door.

To obtain maximum results in road illumination and the safety that has been built into the headlighting equipment, the headlamp beams must be properly aimed.



1. Vertical Adjustment
2. Horizontal Adjustment

FIGURE 38—*Head Lamp Adjustment.*

Locate the car on a level floor (with no passengers in the car). Place a light colored vertical screen 25 feet ahead. (A vertical wall may be used.) Draw a horizontal line on the wall three inches below the headlamp center level, and draw a vertical line directly ahead of each lamp. The vertical line, midway between the headlamps, may be located by sighting through the center of the rear window and over the center of the hood.

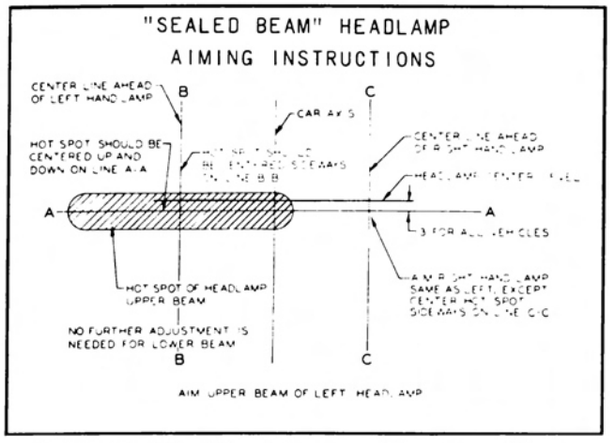


FIGURE 39—*Head Lamp Adjusting Chart.*

Cover one lamp and adjust the other lamp by centering the high intensity beam (Fig. 39).

Repeat the operation for the second lamp. No further adjustment is needed for the lower beam.

CAUTION: *If your state requires a loading allowance, draw the horizontal line below the level line by the amount required in your particular state.*

LIGHT SWITCH

"Ambassador" and "Statesman" Series

The main lighting switch is located at the left side of the dash panel between the radio speaker grille and windshield wiper control.

To remove the light switch assembly, remove the knob with an Allen wrench (Fig. 40).

Then remove the retaining (French) nut.

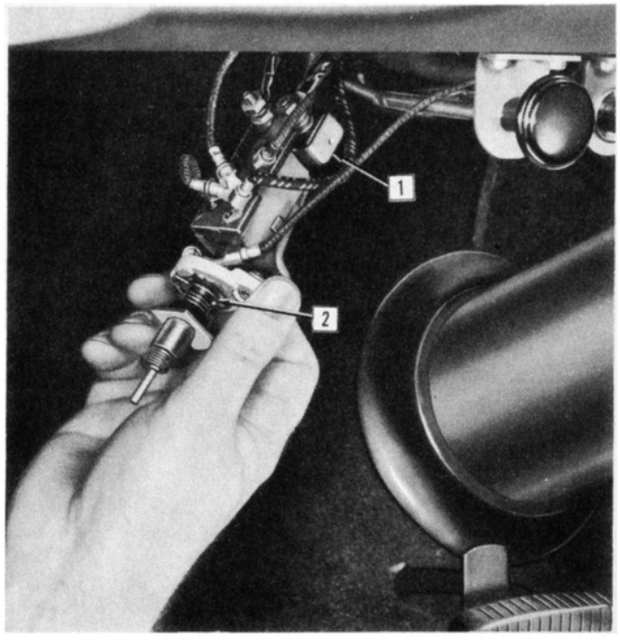
The light switch assembly can now be removed from the dash panel and lowered to provide access to the wiring (Fig. 42).



FIGURE 40—*Removing Light Switch Knob.*

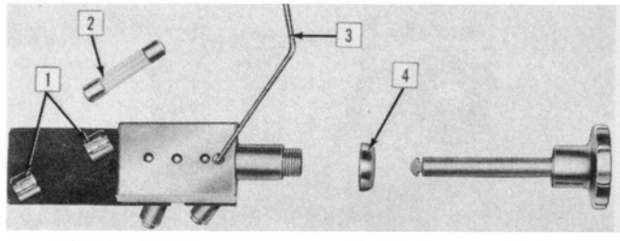


FIGURE 41—*Removing Light Switch Retaining Nut.*



1. 30 Ampere Circuit Breaker
2. Resistor for Dash Instrument Lighting

FIGURE 42—*Light Switch Removed From Dash.*



1. Fuse Holder
2. 30 Ampere Fuse
3. Stiff Wire to Release Knob and Shaft
4. French Nut

FIGURE 43—*Light Switch Assembly "Rambler" Series.*

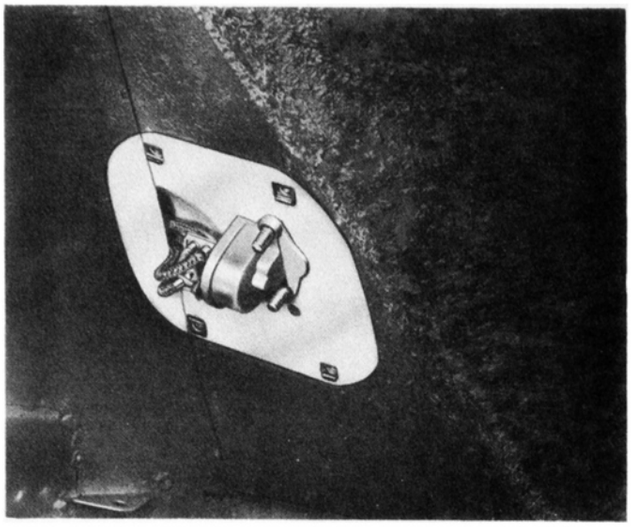
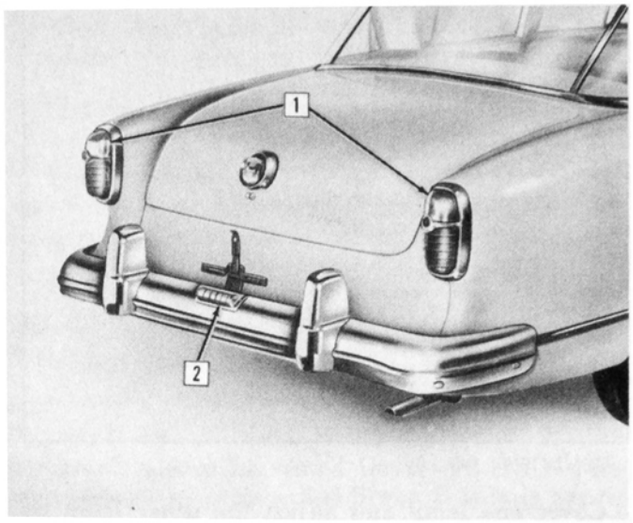
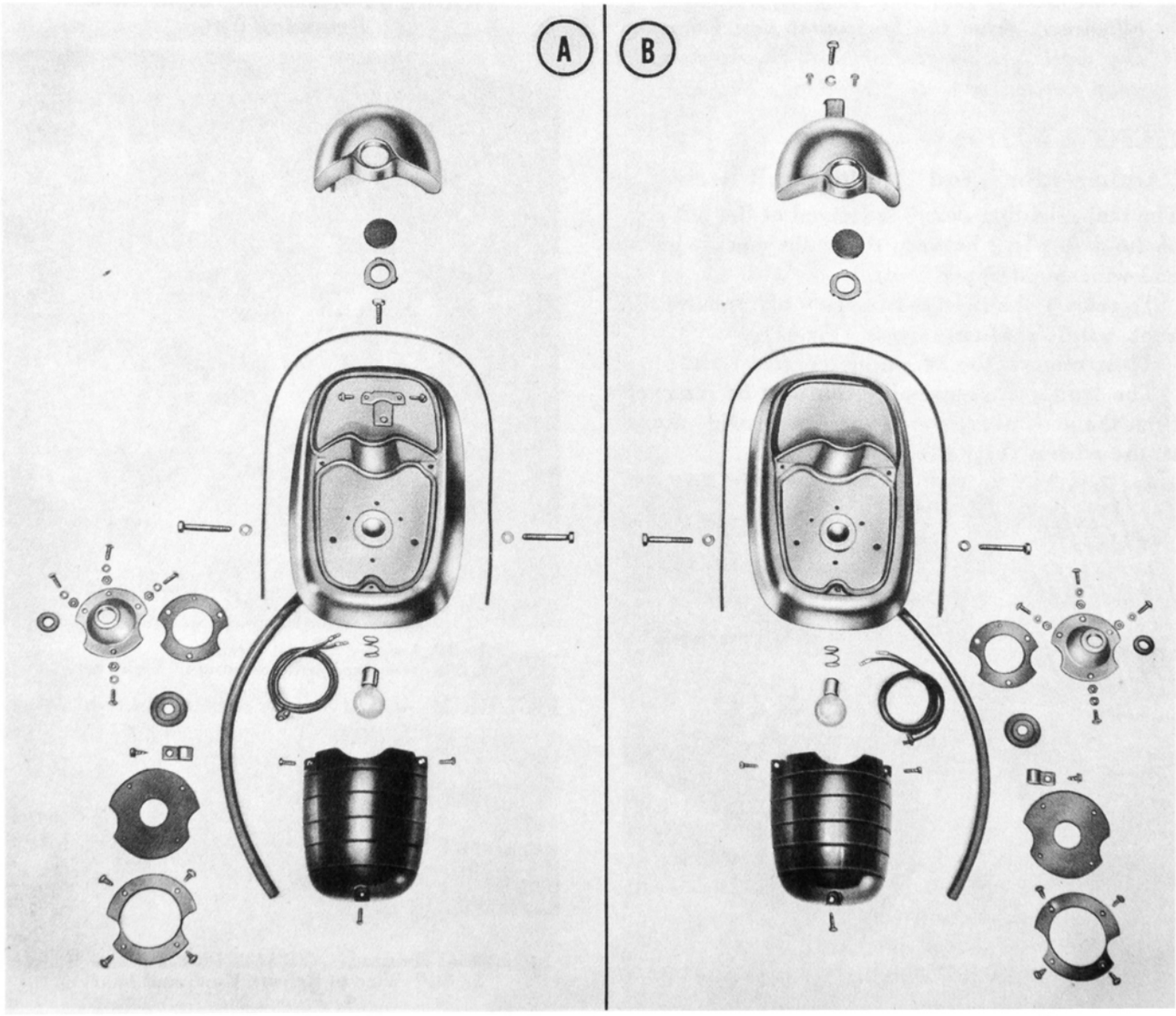


FIGURE 44—*Headlight Dimmer Switch "Ambassador" and "Statesman" Series.*



1. Tail, Stop, and Directional Lamp Assembly
2. License Lamp Assembly

FIGURE 45—*Parking, Tail, Stop, and Directional Signal Lighting.*



A. Left Hand Assembly

B. Right Hand Assembly

FIGURE 46—*Tail Lamp Assembly Components "Ambassador" and "Statesman" Series.*

"Rambler" Series

Disconnect the instrument switch panel from the dash panel. Place the switch in the full "on" position and insert a stiff wire, or paper clip, in the hole provided to release the switch shaft and knob assembly (Fig. 43). Then remove retaining (French) nut.

HEADLAMP DIMMER SWITCH

The "Ambassador" and "Statesman" Series dimmer switch is located below the left front fender on the toe board. It is protected with a shield which must be removed from below the car before the switch can be removed (Fig. 44).

PARKING, TAIL, STOP AND DIRECTIONAL LIGHTING

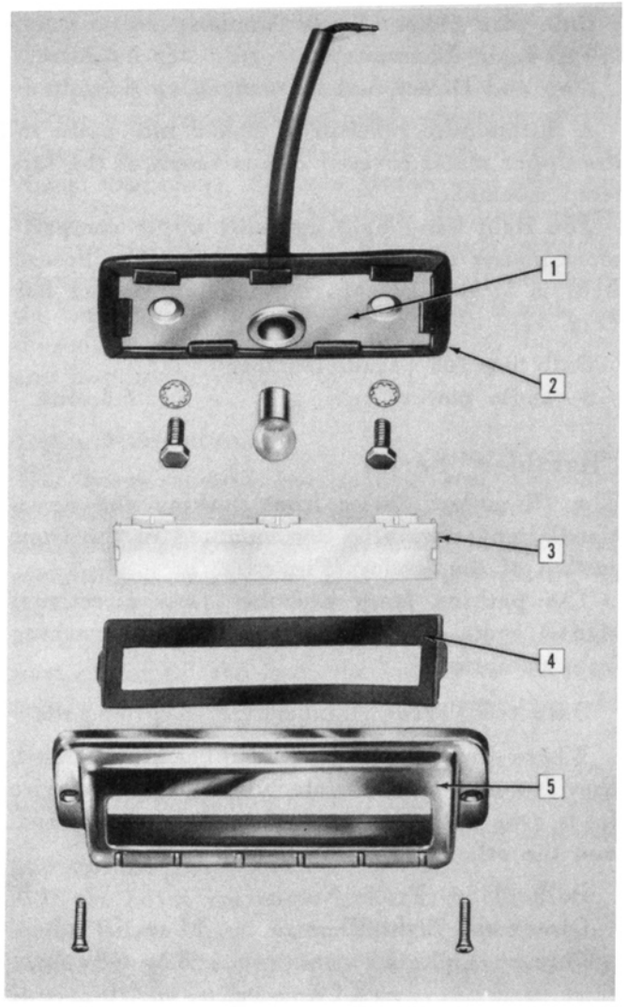
"Ambassador" and "Statesman" Series

Parking and directional signal lights are mounted in a single assembly located below the headlamp (Fig. 38). Double contact bulbs are used in parking and directional signal light sockets. One element for parking light the other for directional signal light.

Bulb #1145 (Trade Number)
Directional Light Element .....21 cp 6-8 volts
Parking Light Element .....3 cp 6-8 volts

Tail, stop, and directional signal lights are all contained in the rear fender light assemblies (Fig. 45).

Double contact bulbs are used in the tail lamp assembly. One element is in the tail light circuit while the other element is alternately in the brake light or directional light circuit depending on how the directional control switch is positioned. The lens are retained with three screws.



1. Socket Assembly
2. Gasket
3. Lens
4. Lens Gasket
5. Lens Bezel

FIGURE 47—*Rear License Light Assembly "Ambassador" and "Statesman" Series.*

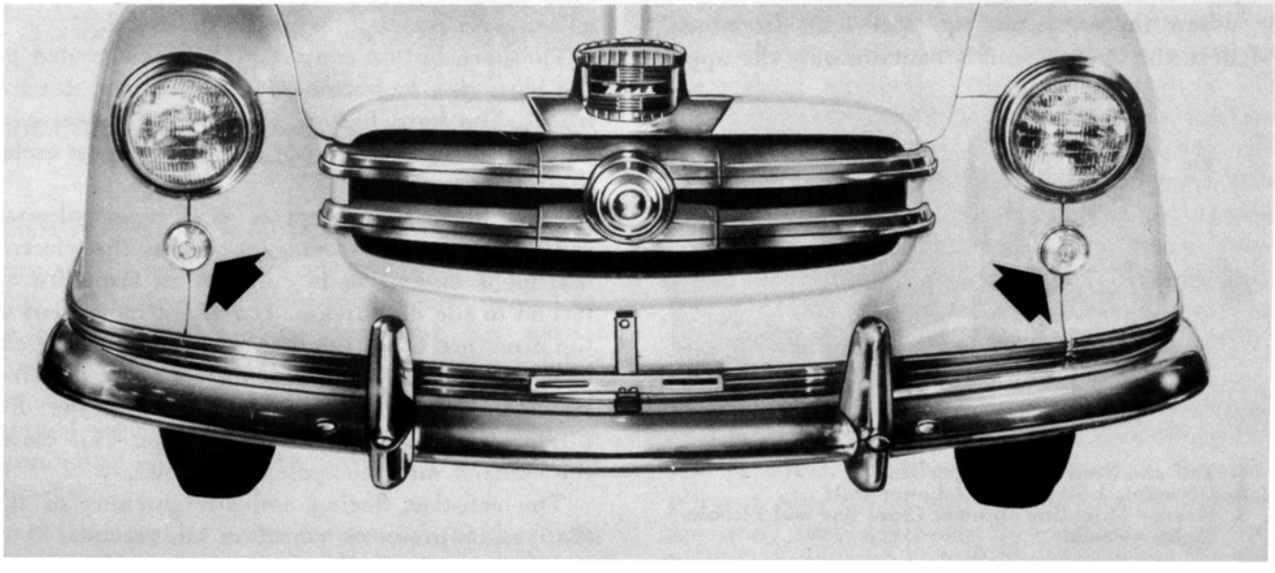


FIGURE 48—*Front Parking and Directional Signal Lights "Rambler" Series.*

Bulb Size #1154 (Trade Number)
Tail Light Element .....3 cp 6-8 volts
Stop and Directional Element 21 cp 6-8 volts

A Stimsonnite reflector is staked into place in the upper metal covered compartment of the tail lamp assembly.

The right hand light assembly upper compartment houses the fuel tank filler cap. The license light is located in the rear bumper impact bar (Fig. 47).

Bulb Size #63 (Trade Number)
3 candle power .....6-8 volts

"Rambler" Series

The "Rambler" Series front parking and directional light assemblies are mounted in the front section of the fender (Fig. 48).

The parking lamp assembly (less directional signal) contains a single contact bulb for parking light operation.

Bulb #63 (Trade Number) ....3 cp 6-8 volts

Where directional light assemblies are installed, they contain double contact bulbs and two wire leads. One bulb element is then directional signal and the other is parking light.

Bulb #1154 (Trade Number)
Directional Light Element ....21 cp 6-8 volts
Parking Light Element .....3 cp 6-8 volts

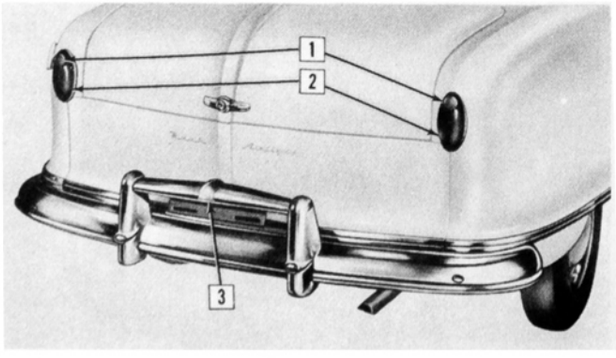
To change a parking light bulb, the snap ring holding the lens in place must be removed. With lens removed, access to bulb is obtained.

Tail, stop, and directional signal lights are housed in rear fender ends. The lamp assembly contains an upper and lower section. The division is part of the lens (Fig. 49).

Where the car is not equipped with directional signals, the lamp assembly contains only the upper light socket assembly. New lamp assemblies with upper and lower light sockets are required when directional signals are installed. The lower light socket then becomes the directional signal light.

To change a tail, stop, or directional light bulb, the lens must be removed. It is held with one center retaining screw.

Bulbs:
Tail and Stop Light ..#1154 (Trade Number)
Stop Light Element .....21 cp 6-8 volts
Tail Light Element .....3 cp 6-8 volts



1. Tail and Stop Light Upper Half
2. Directional Signal Light Lower Half
3. License Mounting Bracket Cross Bar and License Light Assembly

FIGURE 49—*Parking, Tail, Stop, and Directional Signal Lighting "Rambler" Series.*

License Light Assembly

The license light is mounted in the rear license plate mounting bracket which is mounted with two metal screws from the rear of the license plate cross bar. To change the bulb, the license mounting bracket must be removed from the license plate cross bar and the socket and lens assembly removed from the license mounting bracket (Fig. 49).

Bulb: T-63 (Trade Number) ..6-8 volt 3 cp

HORN EQUIPMENT

Horns and Relays

The horn circuit includes a matched pair of horns, the horn relay, the battery, the horn button, and the car frame. With the relay in the circuit, the button is required to carry only the relay control current. Therefore, the spark formed when the button contacts open is much less than it would be if all the current flowed through the button.

The "Ambassador" and "Statesman" Series horns are mounted on the right and left wheelhouse panel extensions behind the radiator grille.

The "Rambler" Series straight twin horns and relay assembly are mounted on the left front wheelhouse panel underneath the hood.

The horn button contact plates are actuated by the horn ring or button contained in the steering wheel. The horn button wire has a bayonet connection at the lower end of the steering post under the hood.

Each horn consists of a diaphragm vibrated rapidly by an electromagnet. When the electromagnet is energized, it pulls on an armature attached to the diaphragm. The slight movement of the armature flexes the diaphragm and also opens a set of contacts. With the contacts open, the electro-magnet is no longer energized and the diaphragm returns to its original shape. This closes the contacts and the cycle is repeated.

The constant flexing and straightening of the diaphragm produces vibration and sound.

A resistance unit is connected across the contact points to reduce arcing and prolong contact life.

The horn relay consists of an electromagnet and a set of contacts arranged so that when the magnet is energized an armature is attracted and the contacts close. A spring keeps the contacts open when the unit is at rest.

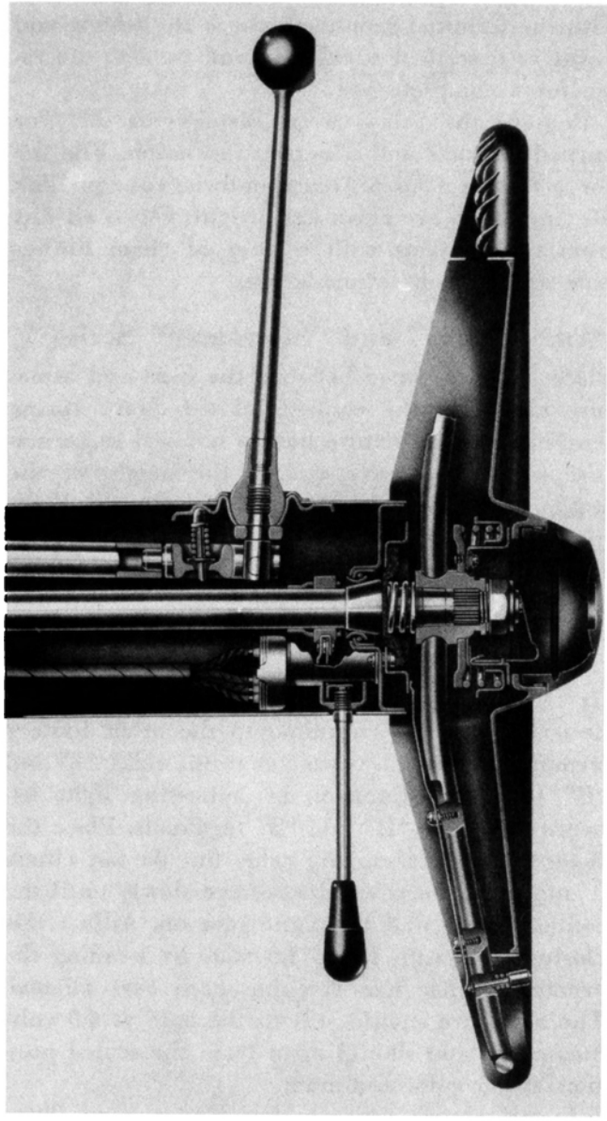


FIGURE 50—*"Ambassador" and "Statesman" "Custom" Horn Blowing Mechanism.*

HORN WIRING MAINTENANCE

Inspect the wiring between the horn, button, relay, and battery for loose connections, chafed insulation, corroded terminals, and for partial breaks—especially where the leads enter a conduit or are clamped by a terminal. This inspection should include the battery ground strap and the grounding of the horn through its mounting bracket.

If the horns do not operate when the horn ring is depressed, check for breaks in the horn button circuit by grounding the relay "S" terminal. If the horns operate, the horns and relay are not defective. Then the horn button and lead should be thoroughly inspected.

The usual cause of continuous operation of the horns is a ground in the horn button wiring. To check, disconnect the horn button lead from the relay "S" terminal. If this stops the horn operation, inspect the button lead for grounds especially where it enters the steering column. If the horns do not stop when the "S" terminal lead is removed, disconnect the other leads from the relay and inspect the relay.

Horn Maintenance

The horns should be cleaned and inspected periodically. If horns are rusted or corroded, they should be removed for overhaul. If the horn mounting is cracked or loose, repairs should be made.

To test whether the horns are inoperative, connect a jumper lead from the battery to the horn terminal. The horns should operate with this lead in place. If they do not, ground the horn frame to the chassis to check the horn ground connection. If the horns now operate, the ground connection is at fault and the horn should be removed and the mounting surfaces cleaned.

If the horns are inoperative or do not have a steady clear tone, they should be removed, cleaned, and disassembled. To remove the horn dome, place a screwdriver between the dome head and the projection and loosen.

Inspect the diaphragm for cracks and distortion and inspect the windings and connections for breaks, faulty insulation, and grounds.

"Ambassador" and "Statesman" Series

Measure the resistance of the resistor by placing a card between the contacts and measuring across the resistor terminals with an ohmmeter. If the measured resistance is not 2.5 to 2.8 ohms, replace the resistor.

Inspect the contacts. Do not force the contacts apart as this would bend the contact spring and change the contact pressure. If the contacts are rough or burned, clean and polish them with crocus cloth and carbon tetrachloride. If the contacts are burned excessively, they should be replaced.

Assemble the horn leaving the horn dome off until after the horn is adjusted. Be sure all gaskets are in place, and thoroughly tighten the diaphragm nut, flange screws, and circuit breaker mounting screws. Inspect to see that the circuit breaker contacts are aligned and that the contact spring does not rub against the armature stud.

Measure the gap between the armature and field cup with two flat feeler gauges. Adjust the gap on all sides to .0495" on the low pitch horn and .040" on the high pitch horn. To adjust, loosen the lock and turn the armature, screwing it in or out as required. It is sometimes necessary to tap the armature spring plate to loosen it from the armature and allow the armature to turn. Tighten the lock nut and check the gap.

The horn tone depends on the horn mounting. Therefore, for the tuning test, the horn should be mounted on the car by its spring brackets. Connect an ammeter and variable resistance in series with the horn terminal and a six volt battery. Ground the horn frame to the other battery terminal. Connect a voltmeter from the horn terminal to the horn frame.

Loosen the contact lock nut and adjust the stationary contact so that the current flow is 15 amperes at 6.2 volts. Tighten the lock nut and recheck the setting. Install the horn dome and open and close the circuit a few times to see that the horn operates properly.

Repeat this adjustment and test on the second horn.

"Rambler" Series

Insert screwdriver in slot opposite the terminal to pry off the caps. Separate the contact points and clean with contact point file. Adjust points by loosening the small lock nut (Fig. 51) and turning the large nut underneath until sound is loud and clear. The small lock nut must be tightened each time the sound level is tested.

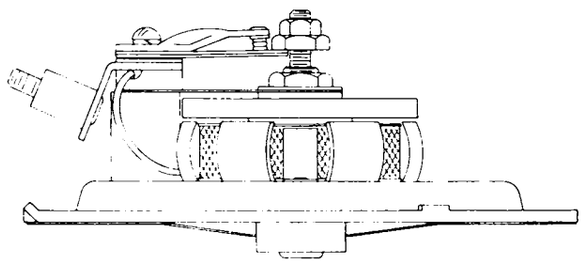


FIGURE 51—*Horn Adjusting Nuts "Rambler" Series.*

HORN RELAY MAINTENANCE

To check the relay operation, ground the relay horn button terminal. If the relay does not close with the terminal grounded, check the wiring and horns as described previously and remove the relay for a complete test.

Remove the relay cover. Inspect for dirty or burned contacts and damaged insulation. File the contacts with a No. 6 American-Swiss cut-equalling file until they are clean and bright. Clean all dirt from the contacts with a strip of clean lintless tape and carbon tetrachloride.

"Ambassador" and "Statesman" Series

Place a feeler gauge between the core and armature and hold the contacts closed. Have spring tension on the armature but do not seal the armature against the core. Adjust the height of the stationary contact to .016" to .020" air gap. Keep the contacts aligned.

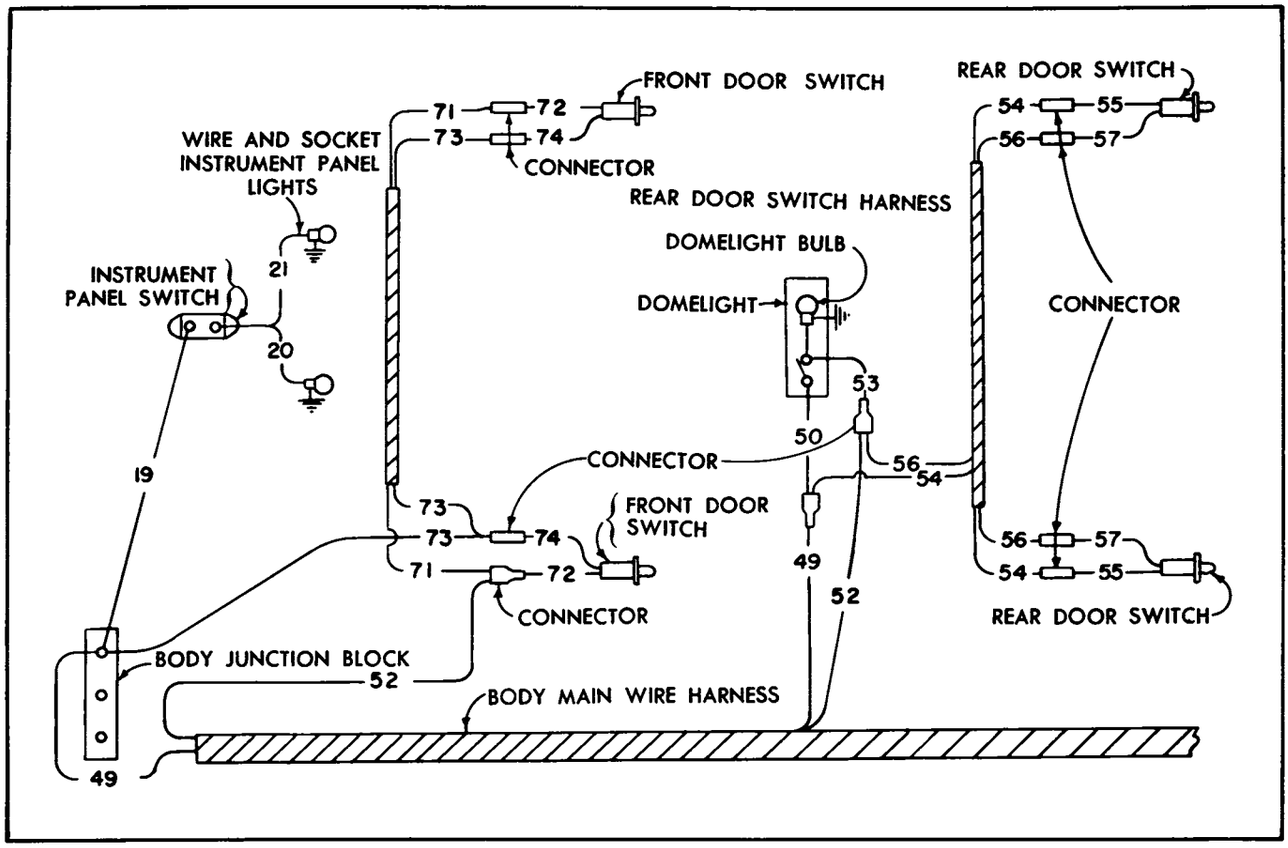
Measure the contact point gap and adjust to .026" by bending the armature stop. Be sure the stop does not interfere with armature movement.

Connect a variable resistance in series with a six volt battery and the relay "B" terminal. Connect the relay "S" terminal to the other battery terminal. Connect a voltmeter to the relay "S" and "B" terminals. Connect an indicating light between the relay "H" and "S" terminals. Place the cover in position on the relay but do not clinch it into place. Increase the voltage slowly until the contacts close and the light goes on. Adjust this closing voltage to 1.5 to 3.0 volts by bending the armature hinge ears keeping both ears aligned. The armature should seal to the core at 4.0 volts maximum, and should open from the sealed position at 0.5 volts minimum.

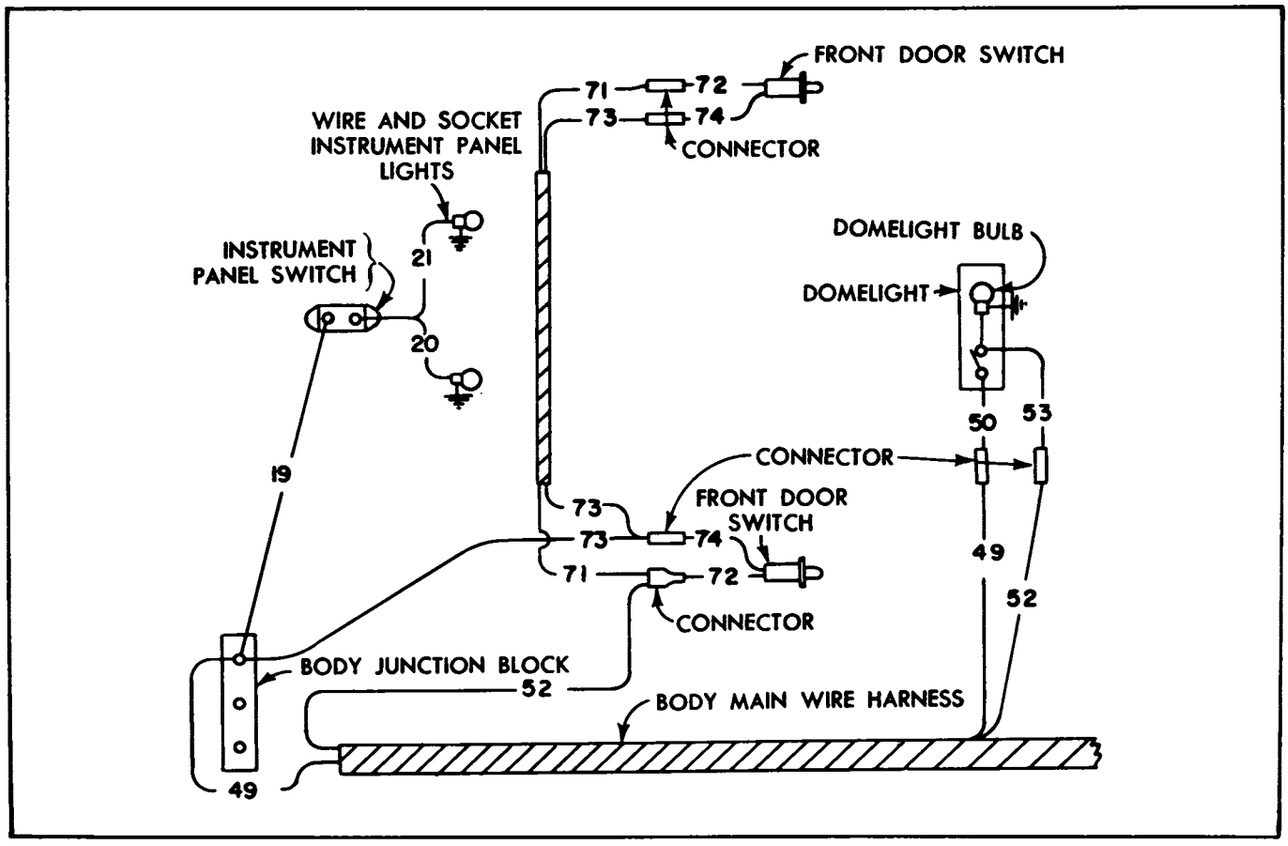
Install a new cover gasket if necessary. Then clinch the cover in place.

"Rambler" Series

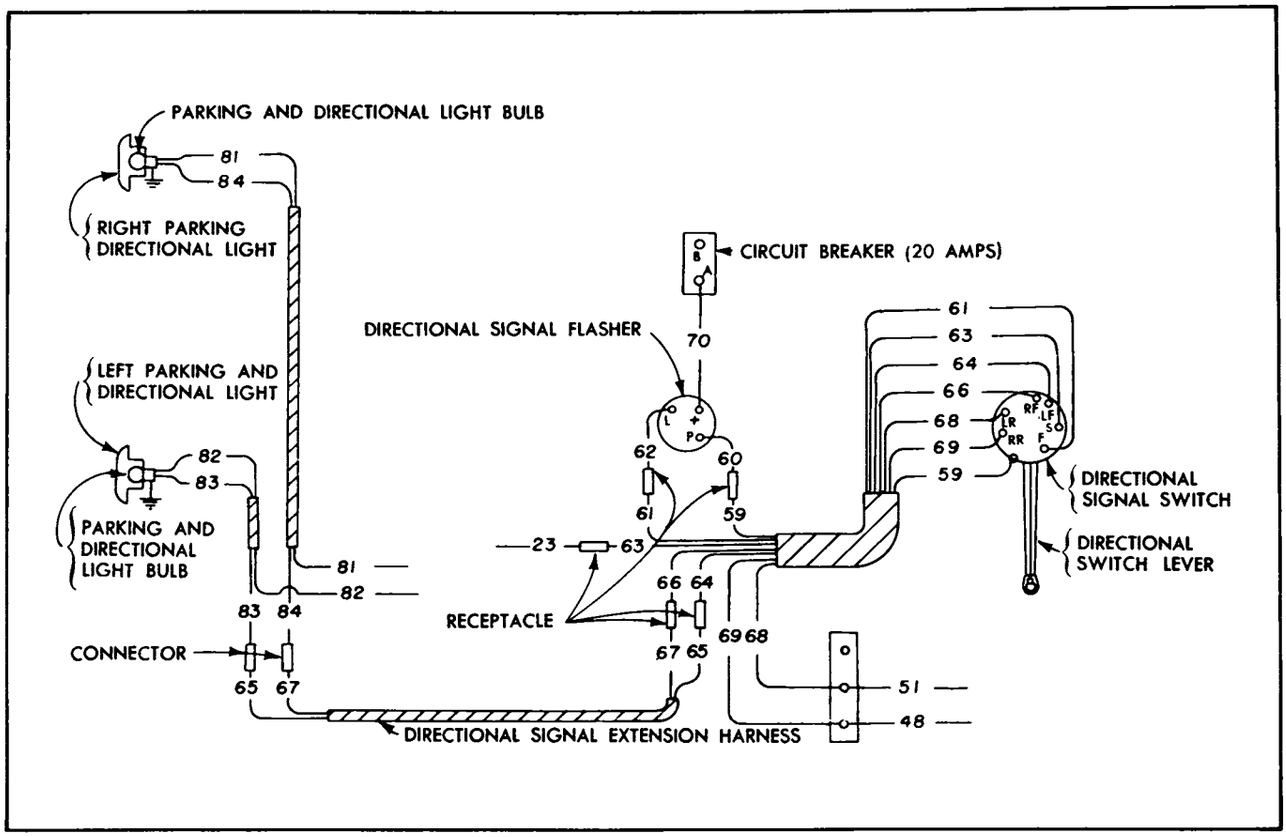
Clean relay points with contact point file. Bend brass strip on top of armature to readjust points to .03125" plus or minus .010".



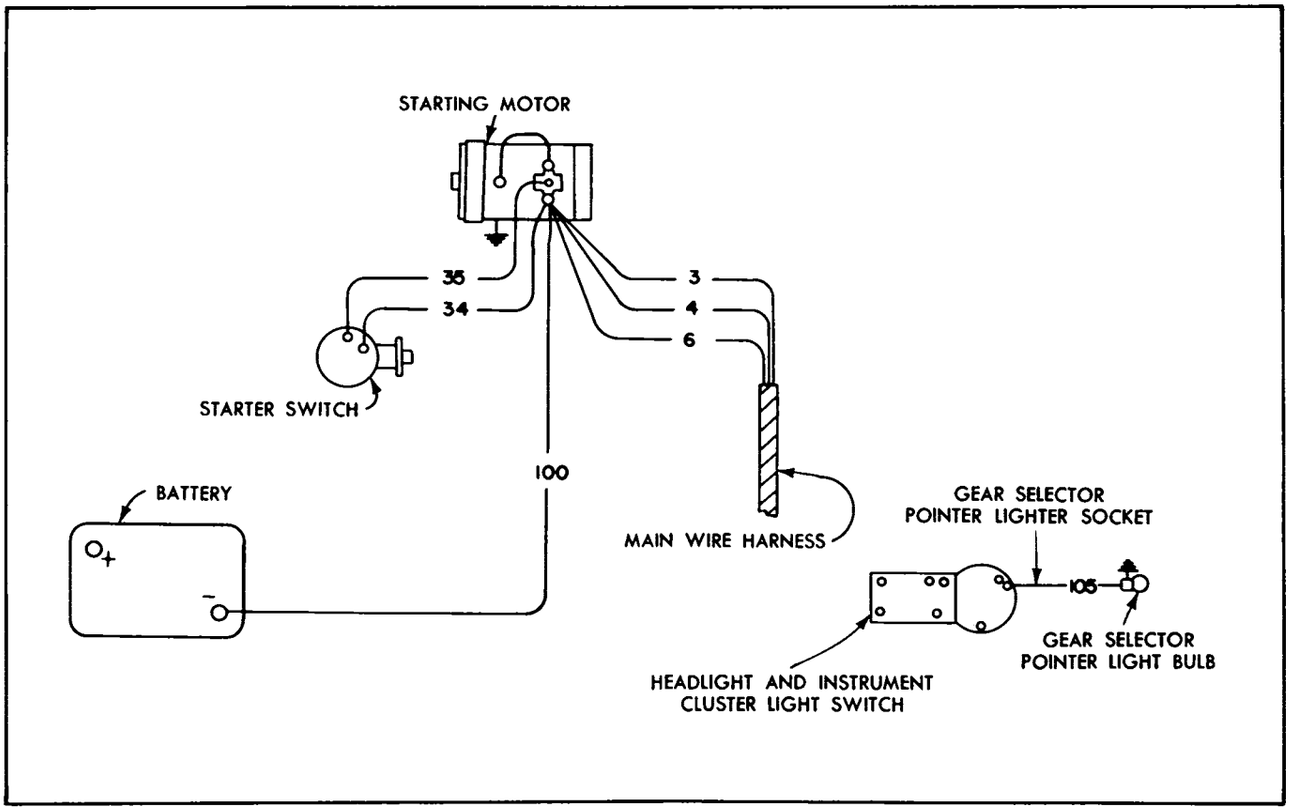
Interior Body Wiring Diagram—"Ambassador" and "Statesman" Series (Custom 4-Door).



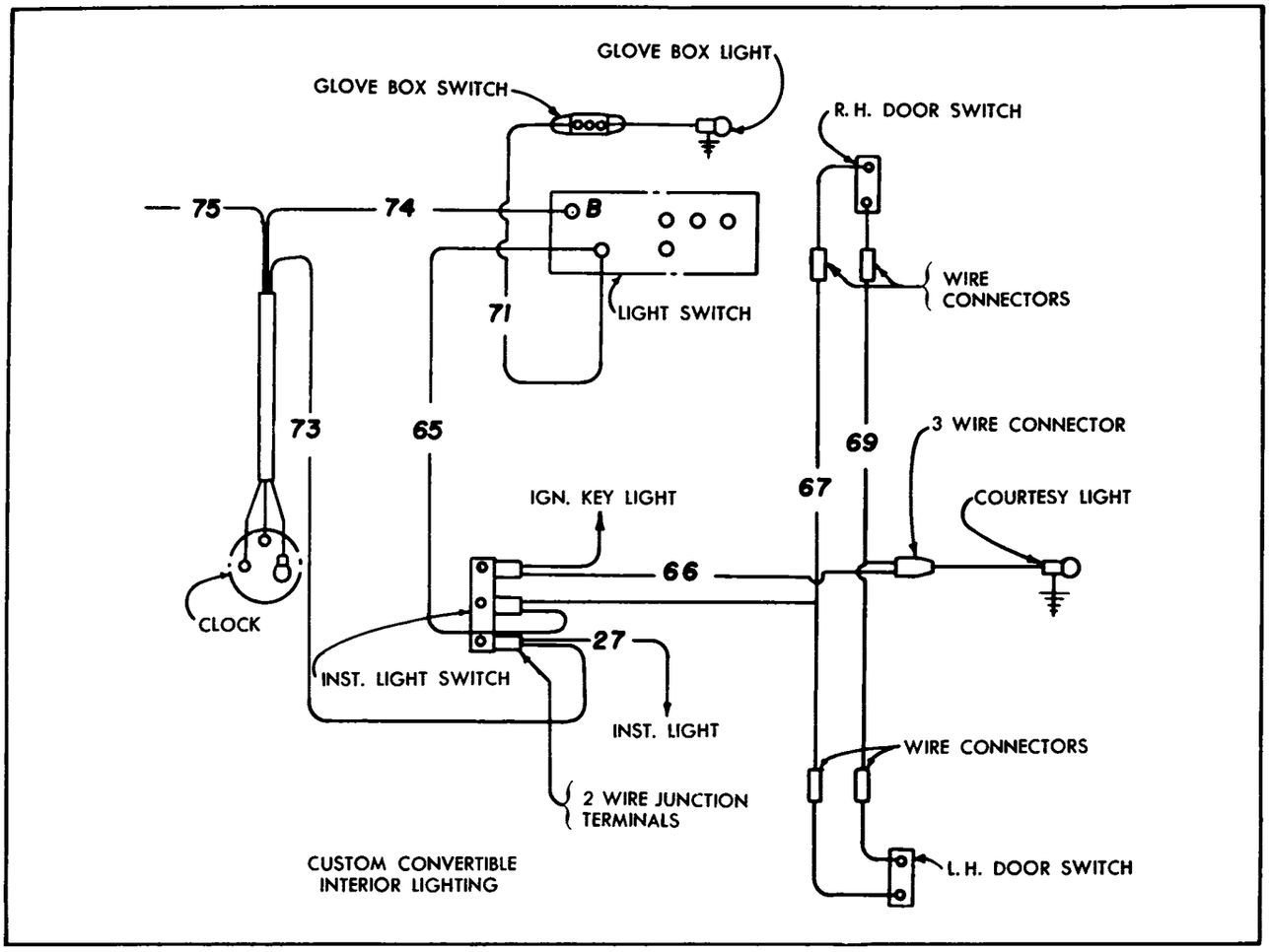
Interior Body Wiring Diagram—"Ambassador" and "Statesman" Series (Custom 2-Door).



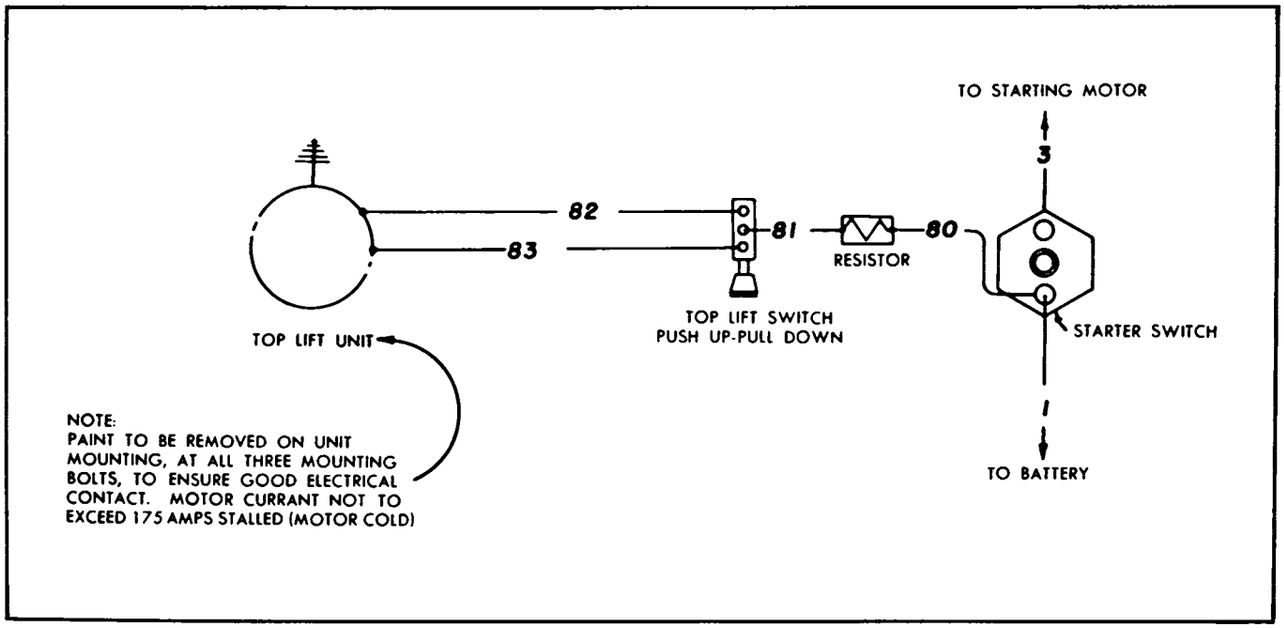
"Ambassador" and "Statesman" Series Directional Signal Wiring Diagram.



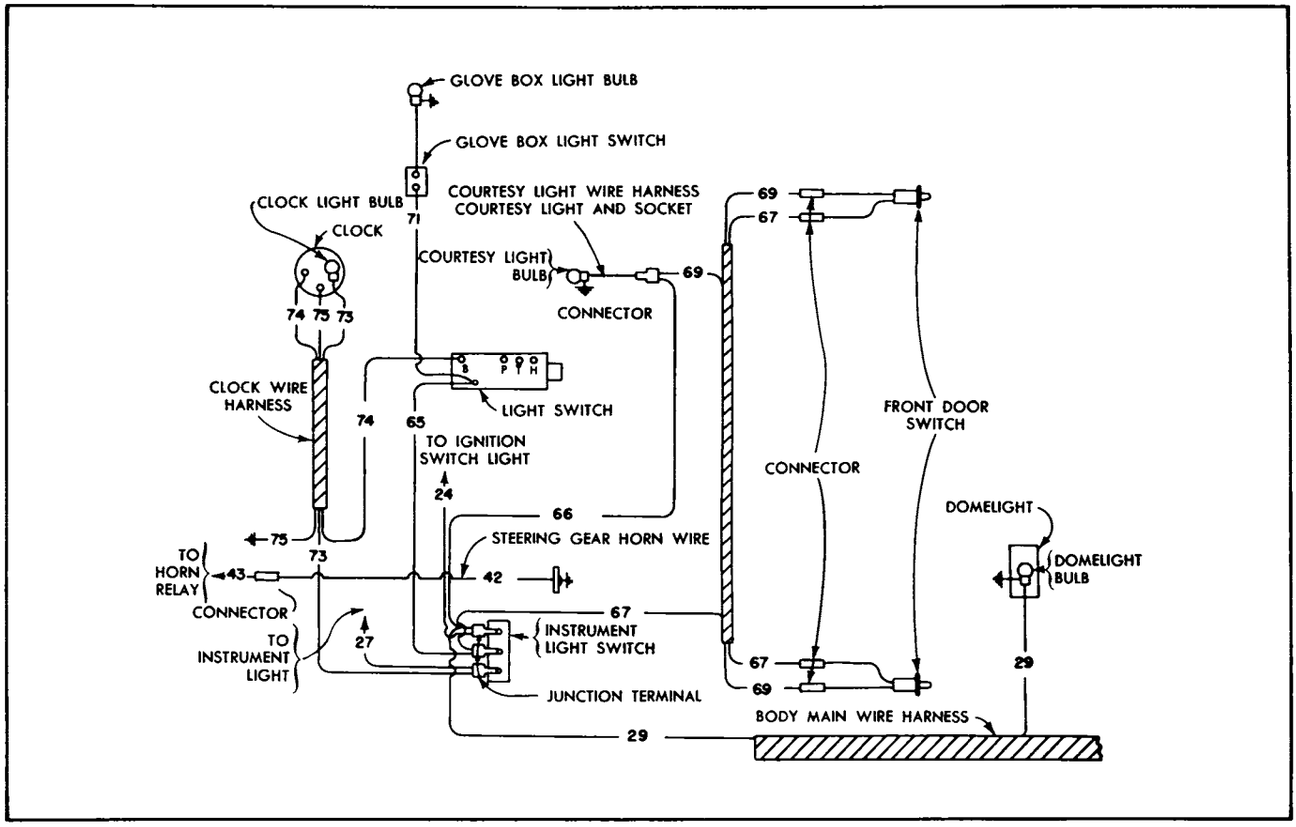
"Ambassador" and "Statesman" Series Hydra-Matic Transmission— Starting Motor Circuit and Indicator Light Wiring Diagram.



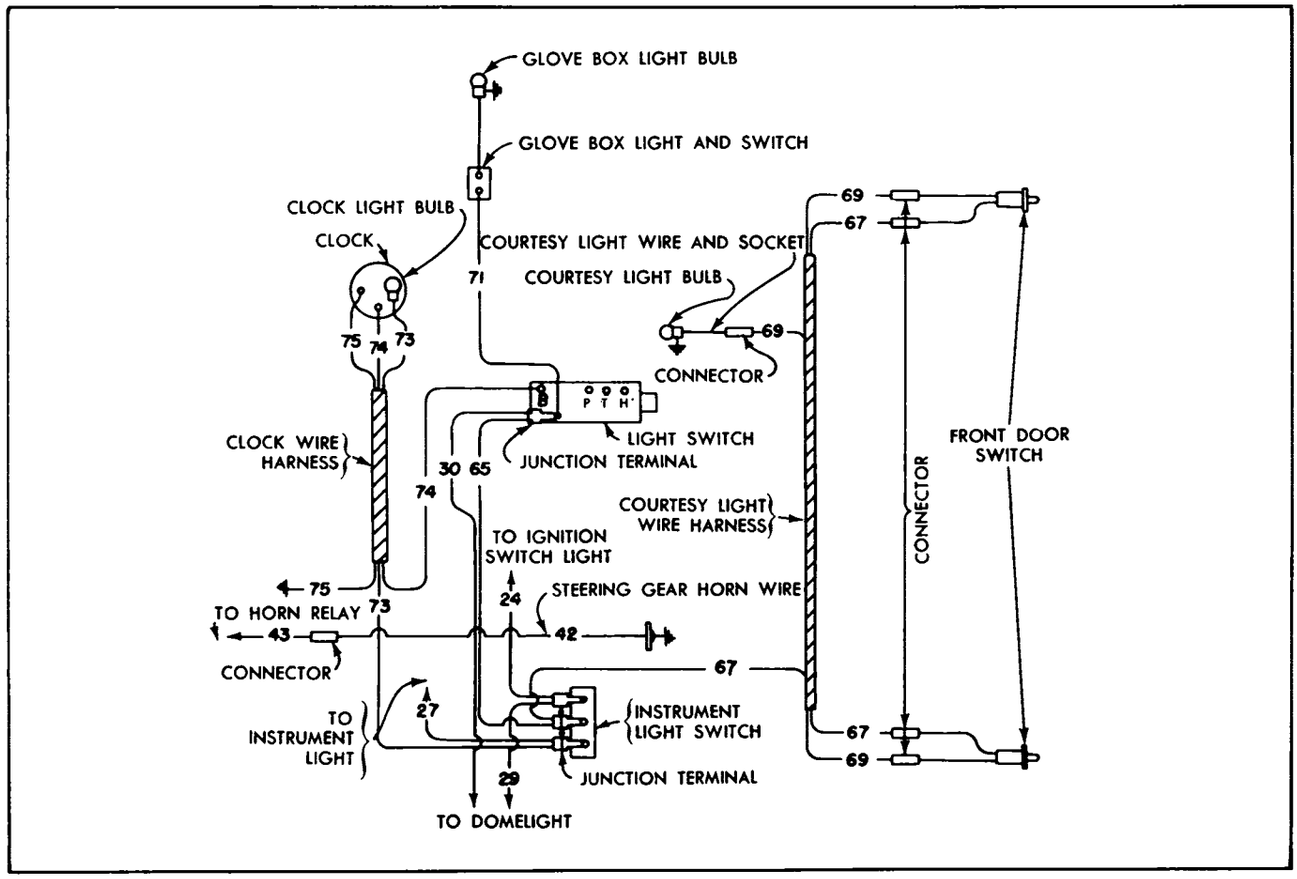
Interior Body Wiring Diagram "Rambler" Series (Custom Convertible) (Clock and Glove Box Circuits are Omitted on "Deliveryman").



"Rambler" Series Convertible Top Power Unit Wiring Diagram.

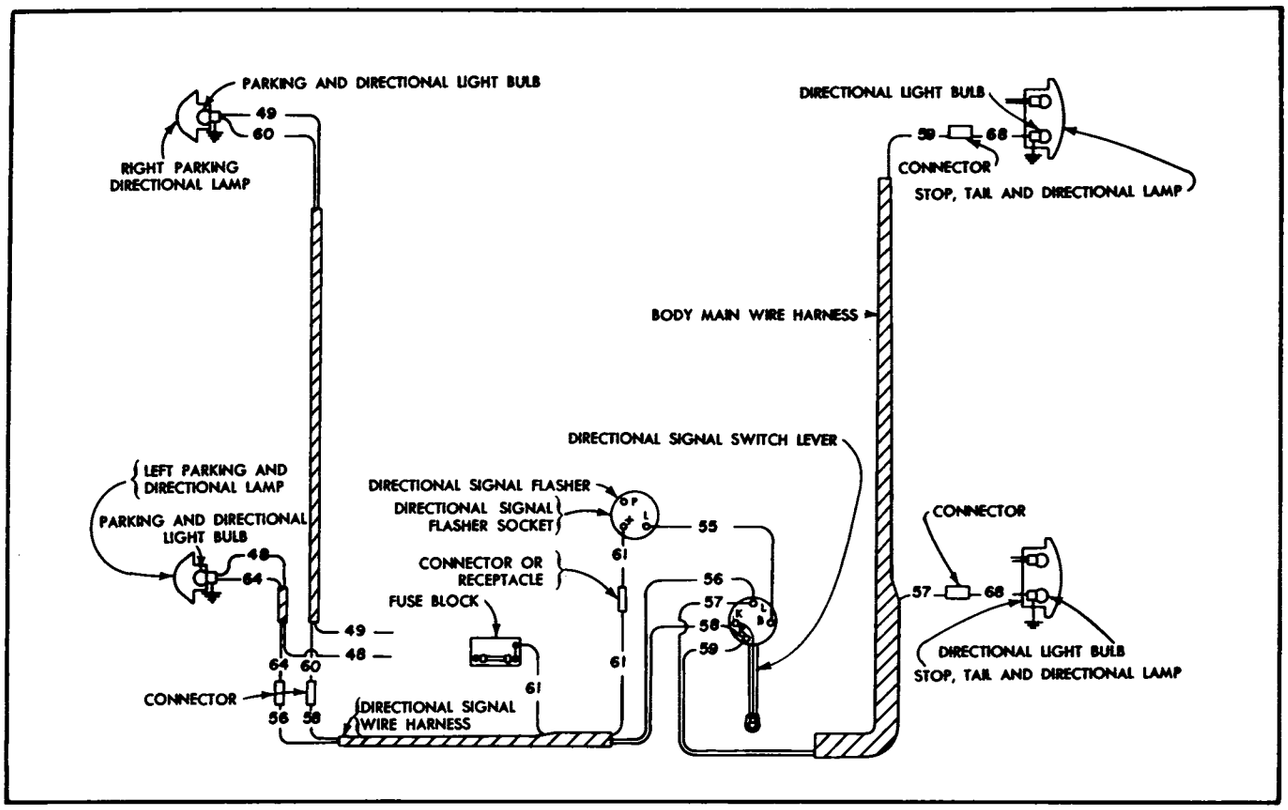


Interior Body Wiring Diagram "Rambler" Series (Custom Station Wagon).



Interior Body Wiring Diagram "Rambler" Series (Country Club).

ELECTRICAL SECTION



"Rambler" Series Directional Signal Wiring Diagram.

LIGHT BULB CHART

	"Ambassador" Series	"Statesman" Series	"Rambler" Series
Headlamp—Sealed Beam	GE-4030	GE-4030	GE-4030
Instrument Bulbs	#55	#55	#55
Front Parking			GE-#63 S.C.
Front Parking and Directional	#1154 D.C.	#1154 D.C.	#1154 D.C.
Rear Tail and Stop			#1154 D.C.
Rear Tail, Stop, and Directional	#1154 D.C.	#1154 D.C.	#1129 S.C.
License Light	#63	#63	#63
Dome Light	#81	#81	#81
Courtesy Lights	#55	#55	#55
Hi-Beam Indicator	#51	#51	#51
No-Charge Light	#51	#51	#51
Low Oil Pressure	#55	#55	#55
Hydra-Matic Selector Dial	#44	#44	

BATTERY SPECIFICATIONS

Series	"Ambassador"	"Statesman" and "Rambler"
Make	Auto-Lite	Auto-Lite
Model	CT-1-15	IM-100
Ampere Hours: 20 Hour Rating	105	100
Amperes: 20 Minute Rating	133	
No. of Plates	15	15

GENERATOR SPECIFICATIONS

Series	"Ambassador" and "Statesman"	"Rambler"
Make	Delco-Remy	Delco-Remy
Model	1102777	1102776
Type	Shunt	Shunt
Rotation	R. H. Drive End	R. H. Drive End
Brush Spring Tension	28 Ozs.	25 Ozs.
Max. Controlled Charging Rate (Controlled by Current Setting)	47 Amperes	38 Amperes

VOLTAGE AND CURRENT REGULATOR SPECIFICATIONS

Series	"Ambassador" and "Statesman"	"Rambler"
Make	Delco-Remy	Delco-Remy
Model	1118732	1118731
Cut-Out Relay Voltage at Closing	5.9–6.7 Adjust to 6.4	5.9–6.7 Adjust to 6.4
Air Gap	.20″	.20″
Voltage Regulator Volts	7.0–7.7 Adjust to 7.4	7.0–7.7 Adjust to 7.4
Air Gap	.075″	.075″
Current Regulator Amperes	45–51 Adjust to 47	34–42 Adjust to 38
Air Gap	.075″	.075″

ELECTRICAL SECTION

STARTING MOTOR SPECIFICATIONS

Series	"Ambassador" Reg. Trans. and Overdrive	"Ambassador" With Hydra-Matic	"Statesman" and "Rambler"
Make	Delco-Remy	Delco-Remy	Delco-Remy
Model	1107950	1107965	1107119 (Std. & O. D.) 1107121 (Hydra-Matic)
Brush Spring Tension	24-28 Ozs.	24-28 Ozs.	24-28 Ozs.
Lock Test Amperage Draw	600	600	550
Volts	3.0	3.0	3.25
Torque in Foot-Pounds	16	14	12
No Load Test Amperage Draw	60	80	70
Volts	5.0	5.7	5.65
R.P.M.	6000	5500	5500

DISTRIBUTOR SPECIFICATIONS

Series	"Ambassador"	"Statesman" and "Rambler"
Make	Delco-Remy	Delco-Remy
Model	1110227	1112382
*Max. Automatic Advance (Engine Degrees and R.P.M.)	30 @ 2700	24 @ 2800
*Max. Vacuum Advance (Engine Degrees)	8°	17°
Vacuum in Inches	14–16	13–17
Dwell Angle	31–37°	31–37°
Rotation	L.H. @ Drive End	R.H. @ Drive End
Breaker Gap	.022″	.022″
Breaker Arm Tension	17–21 Ozs.	17–21 Ozs.
Condenser Capacity	.18 to .23 Mfd.	.18 to .23 Mfd.

*NOTE: Low Limit 4 Degrees Less

MISCELLANEOUS SPECIFICATIONS

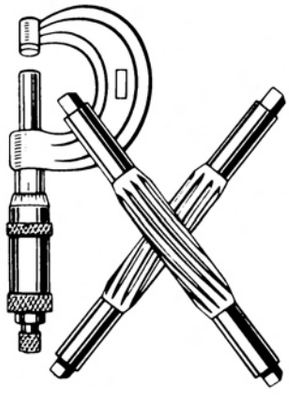
Series	"Ambassador"	"Statesman" and "Rambler"
Timing, Breaker Points Open	T.D.C.	T.D.C.
Timing Mark Location	Vibration Damper	Vibration Damper
Firing Order	1, 5, 3, 6, 2, 4	1, 5, 3, 6, 2, 4
Spark Plug	A7A, J-10, AC44	A7A
Thread	14 MM.	14 MM.
Spark Plug Gap	.030″	.030″

TECHNICAL SERVICE LETTER REFERENCE

Date	Letter No.	Subject	Changes information on Page No.

Nash

TECHNICAL SERVICE MANUAL



FUEL—CARBURETION—EXHAUST SYSTEM

FUEL SYSTEM 2

AIR CLEANERS 2

FUEL TANKS 2

FUEL PUMP
- Service and Adjustments 4

CARBURETOR ("AMBASSADOR" SERIES)
- Disassembly 6
- Assembly 8
- Adjustments 9
- Specifications 10

CARBURETOR ("STATESMAN" AND "RAMBLER" SERIES)
- Circuits 11
- Adjustments 11
- Specifications 13

EXHAUST SYSTEM
- Exhaust Pipe 14
- Muffler 15
- Tail Pipe 15

SERVICE LETTER REFERENCE 17

FUEL-CARBURETION-EXHAUST

FUEL-CARBURETION-EXHAUST SECTION

FUEL SYSTEM

Air Cleaners

Air cleaners of either the wet (oil bath) or dry (maze) type are used. The air cleaner is a vitally necessary item of equipment, protecting the fuel system and the working parts of the engine from the abrasive, clogging action of dust, dirt, and sediment normally present in the combustion air supply. The lower portion of the assembly in either type of air cleaner is designed as a resonance silencer for eliminating the noise of objectionable vibration periods coming out of the carburetor. The air cleaner should be in place on the carburetor air horn whenever the engine is in operation.

Oil Bath Air Cleaner—Service

Oil bath air cleaners should be serviced at least every 5000 miles. If very dusty operating conditions exist, more frequent service is needed.

To service, disassemble and clean all parts thoroughly in kerosene or solvent. Blow off the excess with compressed air. Fill the oil bath to the level indicated, using SAE 50 for moderate weather, and SAE 20 when operating in temperatures below freezing. Reassemble and install.

Dry Air Cleaner—Service

Dry air cleaner filter elements should be cleaned every 2000 miles or oftener under extremely dusty conditions. To service, disassemble and clean all parts of the cleaner in kerosene or a suitable solvent.

After draining and blowing off excess fluid, dip the maze (wire) in light engine oil. Reassemble and install.

FUEL TANKS

Twenty gallon fuel tanks are used on all series. They are suspended at the rear of the underbody by a steel strap.

The fuel tank filler cap is located within the upper compartment of the right hand tail, stop, and directional light assembly on the "Ambassador" and "Statesman" Series (Fig. 1).

The fuel tank filler cap is located in the left fender panel on the "Rambler" Series.

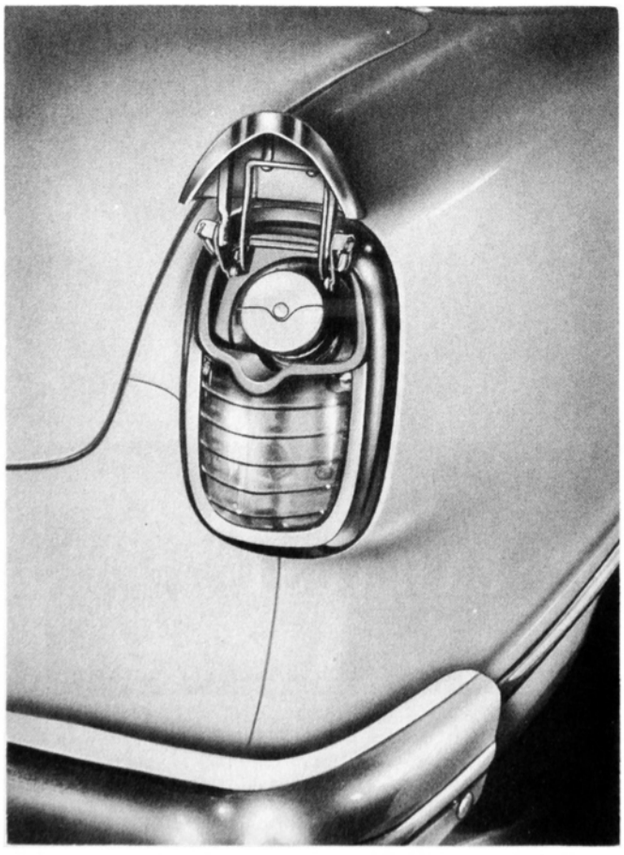


FIGURE 1—*Fuel Tank Filler Cap Location.*

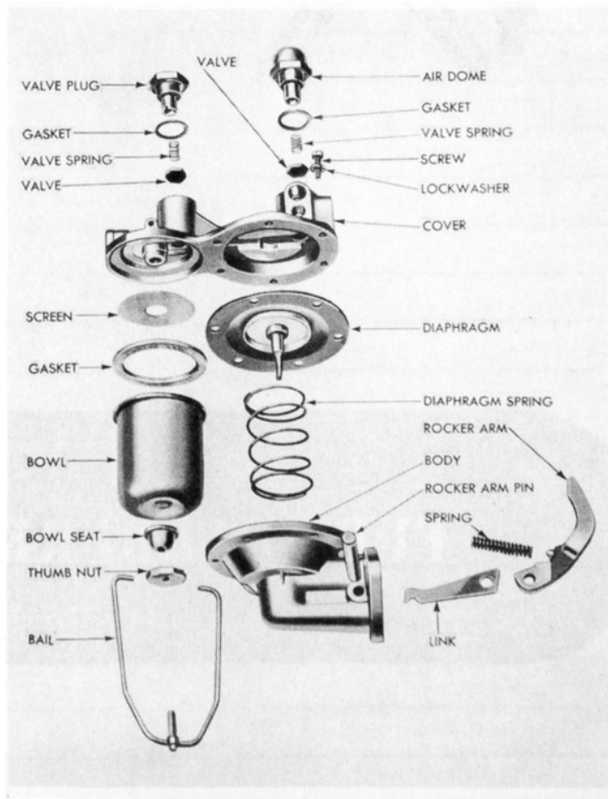


FIGURE 2—*A.C. Single-Acting Fuel Pump "Ambassador" and "Statesman" Series.*

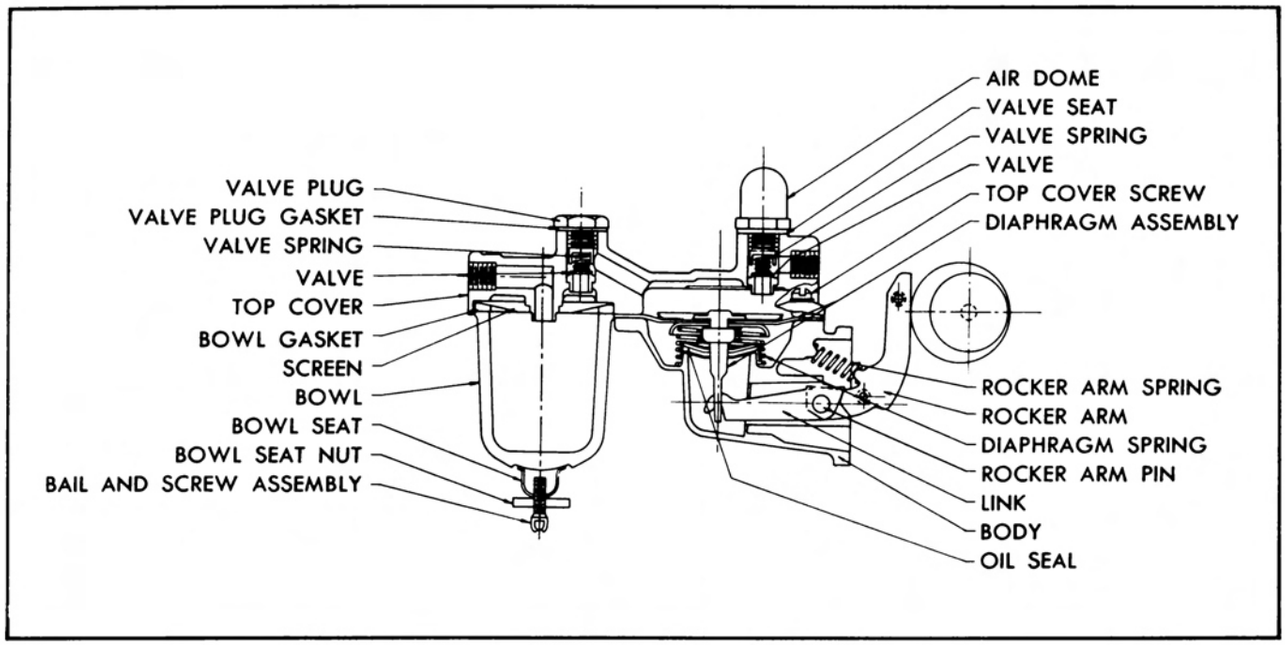
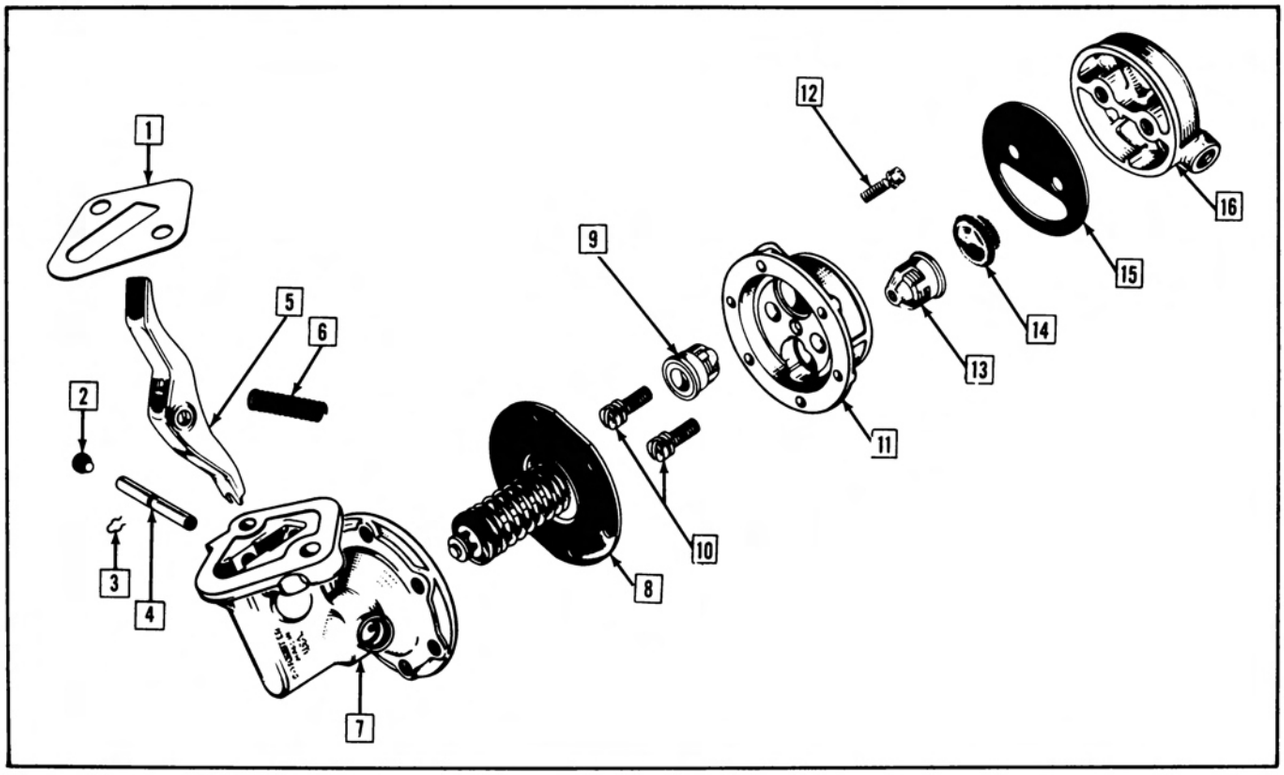


FIGURE 3—*A.C. Single-Acting Fuel Pump "Ambassador" and "Statesman" Series.*



1. Flange Gasket
2. Cam Lever Pin Plug
3. Pin Spring
4. Cam Lever Pin
5. Cam Lever
6. Cam Lever Return Spring
7. Pump Body
8. Diaphragm Assembly
9. Valve Cage Assembly
10. Bowl Cover Attaching Screw and Washer Assembly
11. Pump Valve Housing
12. Valve Housing Attaching Screw and Washer Assembly
13. Valve Cage Assembly
14. Strainer
15. Outlet Air Dome Diaphragm
16. Valve Housing Cover

FIGURE 4—*Exploded View Carter No. 774-S Fuel Pump "Rambler" Series.*

FUEL PUMP

The fuel pump rocker arm is actuated by a cam on the engine camshaft. The fuel pump provides a steady supply of fuel at a fairly constant pressure to the carburetor float needle valve. When the carburetor needle valve closes, accumulation of fuel in the fuel pump body extends the diaphragm and compresses the diaphragm spring. This causes the rocker arm linkage to become momentarily inoperative allowing the pump discharge pressure to be controlled by the diaphragm spring.

In all cars without overdrive, a single-acting type fuel pump is used.

Models equipped with overdrive or automatic transmission use the double-acting or combination fuel and vacuum pump.

This pump, in addition to furnishing fuel pressure, has a vacuum booster pump incorporated in it. This second pump helps to boost intake manifold vacuum to give more steady windshield wiper operation during periods when the overdrive is in use.

Both types of fuel pumps have an air dome on the discharge side to dampen out the pulsations in flow. This minimizes the flow variations and increases the pump output.

Fuel pumps like carburetors require occasional overhaul. Repair kits for this purpose are available.

Service and Adjustments

Fuel pump repairs are divided into two classifications:

Repairs made without disturbing pump installation.

Repairs which necessitate removal and disassembly of the fuel pump.

NOTE: *When "trouble-shooting" the fuel system, eliminate all possible troubles outside the pump such as leaky or plugged lines, empty tank, or stopped air vent before suspecting the pump.*

Repairs Made Without Removing Pump

First check the fuel pump. If capacity and pressure are correct, the trouble must be elsewhere. Check the carburetor float and needle for proper functioning. If the pump fuel capacity is low, check the fuel lines for leaks, split seams, kinks, or other defects.

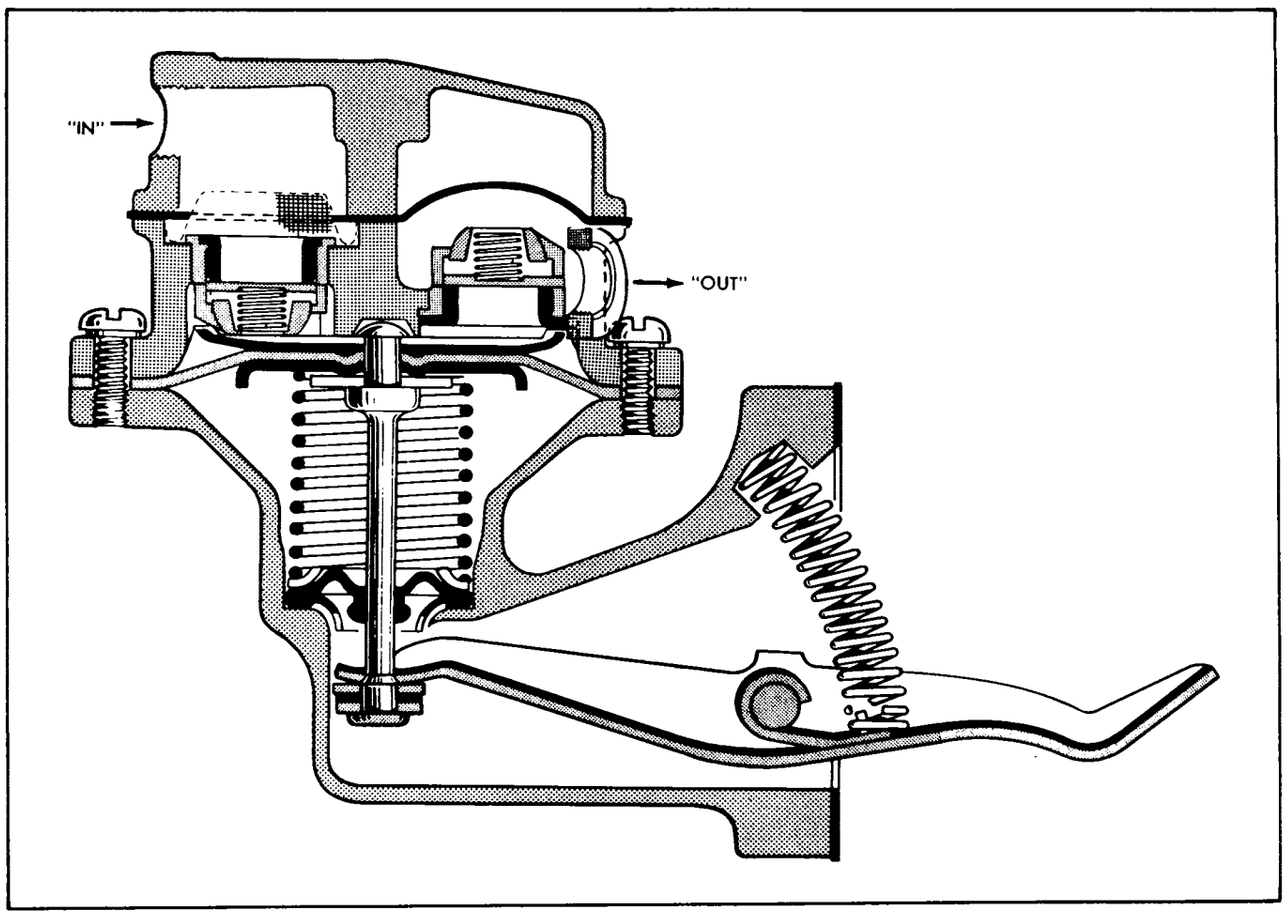


FIGURE 5—*Sectional View of Carter Single-Acting Pump "Rambler" Series.*

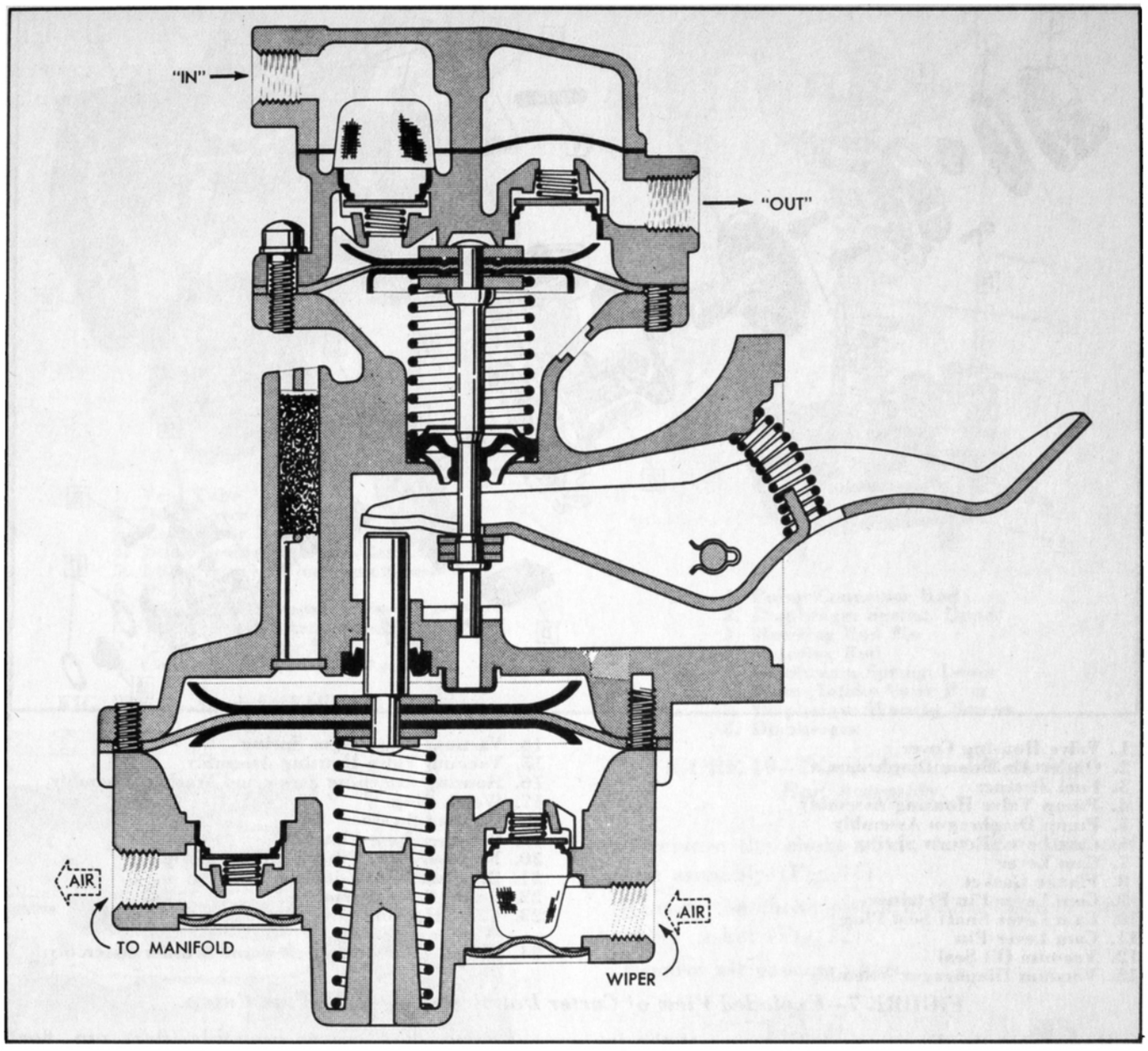


FIGURE 6—*Sectional View of Carter Double-Acting Type Fuel Pump.*

Fuel Pump Tests

The following tests apply to both the single type and combination fuel and vacuum pumps (all series):

On Engine:

Volume test: one quart of fuel in one minute or less at 500 R.P.M. engine speed.

Vacuum test: at least ten inches (10″) Hg. (vacuum) at 500 R.P.M. engine speed. Fuel line from pump to carburetor should be disconnected so pump will operate at full capacity.

Pressure test: three and one-half pounds (3½ lbs.), P.S.I. pressure minimum to five and one-fourth pounds (5¼ lbs.), P.S.I. maximum at 500 R.P.M. engine speed.

The last test should be made with a pressure gauge connected to a "T" fitting at the carburetor. The length of the hose on the pressure gauge should not exceed six inches (6″). Inaccurate pressure readings may result if a longer hose is used between the "T" connection and the pressure gauge.

Bench Test:

Clamp pump in a vise. If vise jaws have serrations, use brass shims to protect gasket surface of pump flange.

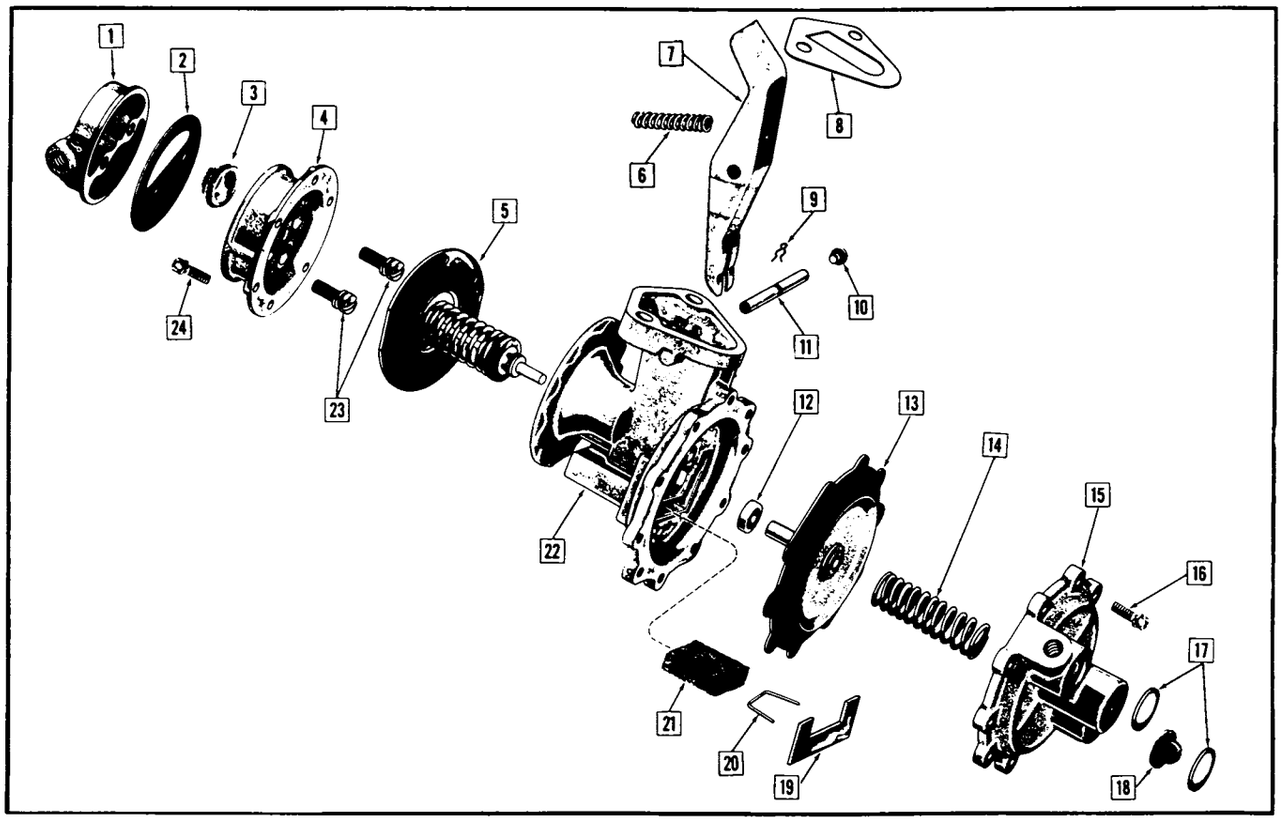
Hook up a mercury manometer or suitable vacuum gauge to intake side of pump.

Actuate pump lever full stroke at approximately 60 strokes per minute. The pump should pull at least 10″ of mercury.

Vacuum Pump Test

On Engine:

With engine idling, turn on the vacuum windshield wiper to make certain the wiper motor is in operating condition.



1. Valve Housing Cover
2. Outlet Air Dome Diaphragm
3. Fuel Strainer
4. Pump Valve Housing Assembly
5. Pump Diaphragm Assembly
6. Cam Lever Return Spring
7. Cam Lever
8. Flange Gasket
9. Cam Lever Pin Retainer
10. Cam Lever Shaft Seal Plug
11. Cam Lever Pin
12. Vacuum Oil Seal
13. Vacuum Diaphragm Assembly
14. Vacuum Diaphragm Spring
15. Vacuum Valve Housing Assembly
16. Housing Attaching Screw and Washer Assembly
17. Welch Plug
18. Vacuum Strainer
19. Breather Vent Plate
20. Breather Vent Filter Retainer Spring
21. Breather Vent Filter
22. Pump Body Assembly
23. Valve Housing Cover Attaching Screw and Washer Assembly
24. Housing Attaching Screw and Washer Assembly

FIGURE 7—*Exploded View of Carter Double-Acting Type Fuel Pump.*

Disconnect the line to vacuum pump at the intake manifold and plug the manifold fitting hole.

With engine running, windshield wipers should operate. If they slow down a trifle but do not stop, the pump is satisfactory.

Assembly On Engine

Extreme care should be used in reassembling the pump to the engine. Fuel pumps must be installed with cam lever on top of camshaft. Do not use an adaptor plate between the pump and engine block. Improper installation will result in a broken pump cam lever.

CARBURETOR

"Ambassador" Series

"YH" Horizontal Climatic Control Carburetor (Carter "YH" 985-S)

Disassembly

Remove the bowl strainer nut and gasket assembly and intake strainer screen (Fig. 8).

Remove bowl cover assembly, float pin, float, and intake needle, and seat assembly.

Remove choke connector rod, throttle shaft arm assembly, and pump connector link.

Remove throttle valve screws and throttle valve. Then remove throttle shaft by carefully tapping the throttle shaft through the throttle shaft retaining ring.

Remove body flange assembly and gasket.

Remove idle mixture adjustment screw and spring (Fig. 9).

Remove idle port rivet plug (use tool T109-210).

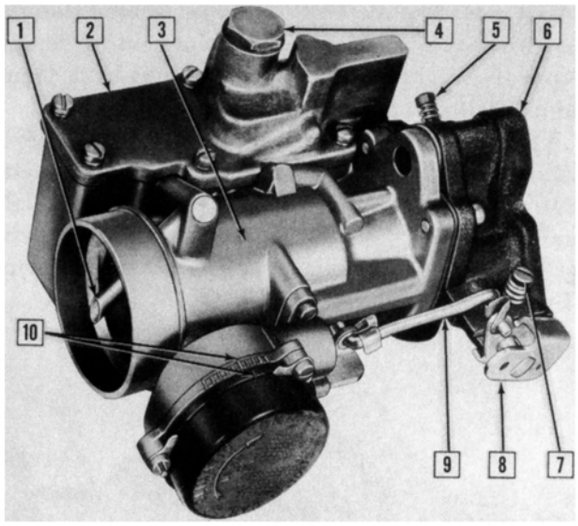
Remove the four diaphragm housing attaching screws and lift out the entire diaphragm and metering rod assembly (Fig. 10).

Remove bowl cover gasket.

Disassemble diaphragm and metering rod unit.

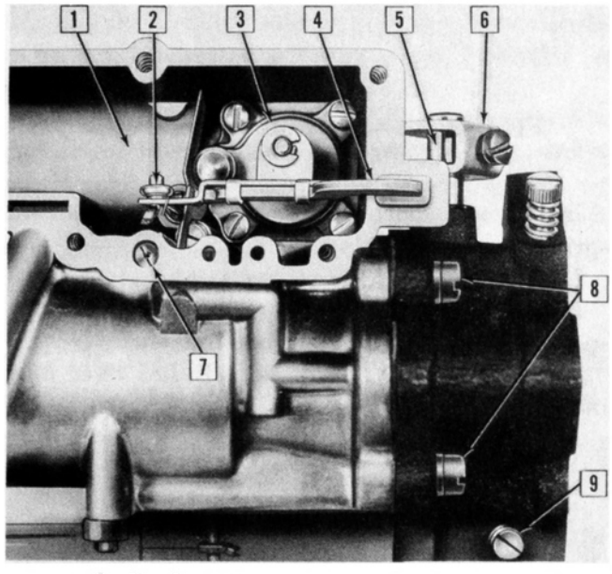
Remove pump intake passage plug and ball check from diaphragm housing.

Remove metering rod jet, pump discharge check plug, spring, ball, and low speed jet.



1. Vent Tube
2. Bowl Cover Assembly
3. Carburetor Main Body
4. Bowl Strainer Nut and Gasket
5. Idle Mixture Adjustment Screw
6. Body Flange
7. Idle Speed Adjustment Screw
8. Throttle Shaft Arm Assembly
9. Choke Connector Rod
10. Choke Index (1 Point Lean)

FIGURE 8—*Model "YH" Carburetor.*

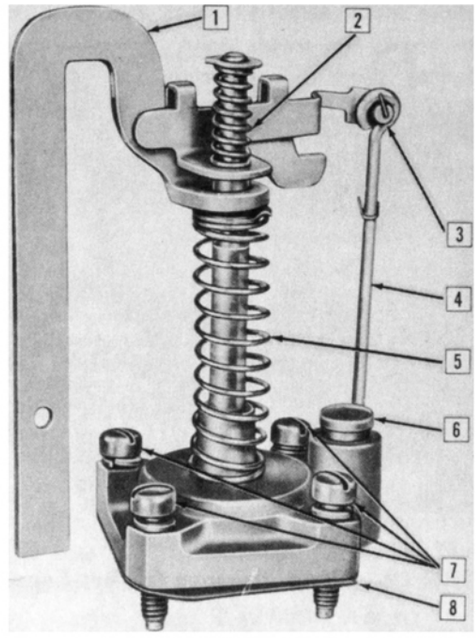


1. Bowl
2. Metering Rod
3. Pump Assembly
4. Pump Connector Rod
5. Pump Connector Link
6. Throttle Pump Lever
7. Idle Orifice Tube and Jet Assembly
8. Flange Screws
9. Idle Speed Adjustment Screw

FIGURE 9—*View of Bowl Showing Pump Assembly.*

Remove the climatic control coil and housing assembly, gasket, baffle plate, and fast idle link.

Remove choke valve attaching screws and choke valve. Revolve the choke shaft counter-clockwise



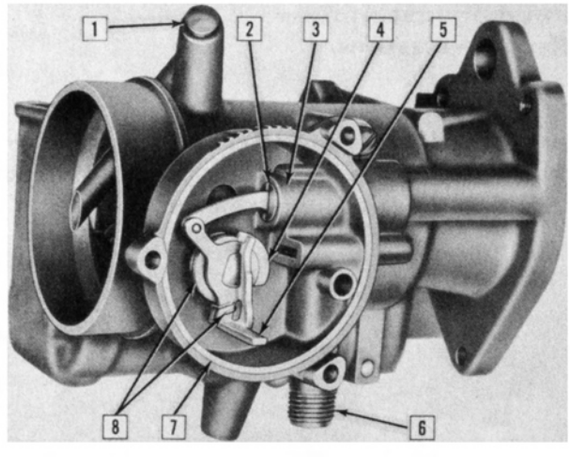
1. Pump Connector Rod
2. Diaphragm Spring, Upper
3. Metering Rod Pin
4. Metering Rod
5. Diaphragm Spring, Lower
6. Pump Intake Valve Plug
7. Diaphragm Housing Screws
8. Diaphragm

FIGURE 10—*Diaphragm and Metering Rod Assembly.*

and remove the choke shaft, fast idle cam, and piston assembly (Fig. 11).

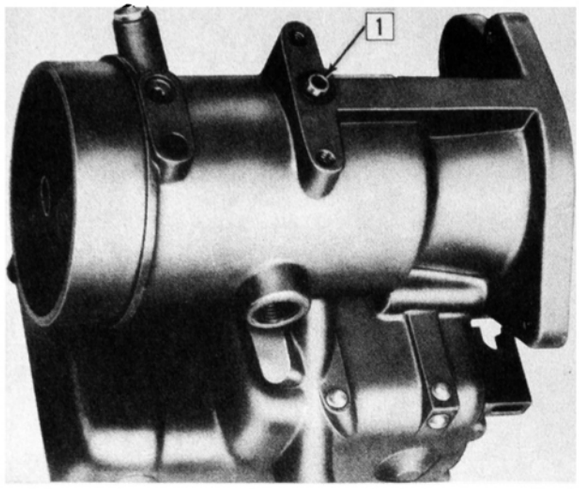
Remove the choke piston housing assembly and housing gasket (Fig. 12).

Remove all passage plugs.



1. Vent Tube Passage Plug
2. Vacuum Piston
3. Vacuum Piston Cylinder Housing
4. Fast Idle Cam
5. Climatic Spring Attaching Arm
6. Heat Stove Line Inlet
7. Choke Housing
8. Fast Idle Cam Spring

FIGURE 11—*Choke Housing Internal View.*



1. Choke Passage Gasket

FIGURE 12—*Choke Passage Gasket Location.*

NOTE: *Do not remove nozzle, bowl vent tube, economizer, passage bushings, and pump jet.*

Wash all parts in carburetor cleaning solution except climatic control coil and housing assembly and diaphragm assembly. Climatic control coil and housing assembly should be cleaned in gasoline.

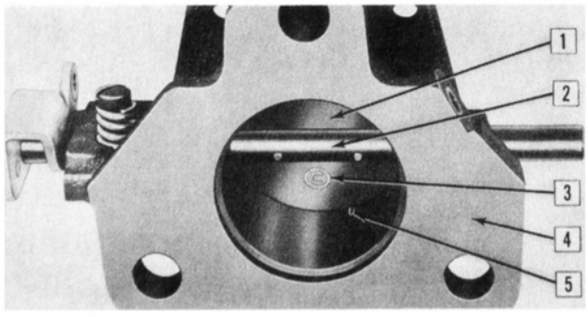
Scrape bore of flange to remove all carbon deposits and blow out all passages with compressed air. If choke piston sticks in its cylinder, remove welch plug in bottom of housing by piercing center with small pointed tool and prying outward. If carbon or dirt is found, clean, and carefully install new welch plug. BE CERTAIN WELCH PLUG IS INSTALLED AIR TIGHT. Inspect all parts for wear or damage; replace if necessary.

Replace all gaskets.

Assembly

Install throttle shaft and lever assembly in flange.

Back out throttle lever adjustment screw and install throttle valve using new screws.

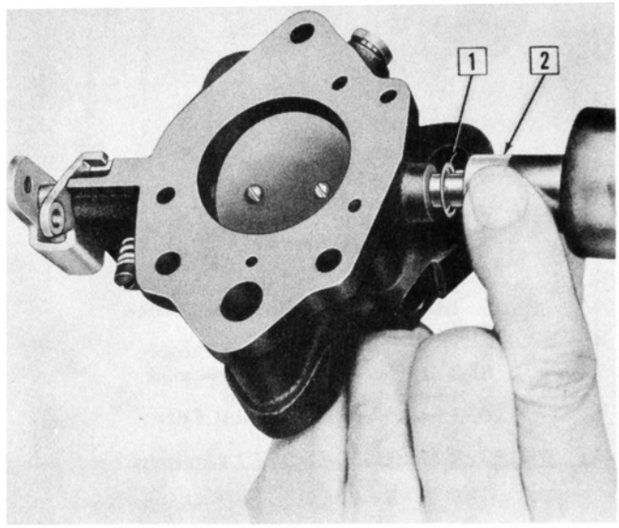


1. Throttle Valve
2. Throttle Shaft
3. Trade Mark
4. Manifold Side of Flange
5. Idle Port

FIGURE 13—*Throttle Valve Installation.*

Carter trademark (C) should be toward the idle port when viewed from the manifold side of flange. Tap valve lightly and hold in place with finger before tightening screws.

With throttle valve closed, press shaft from lever side and install throttle centering washer with prongs extending outward; press washer tight against casting. Use the drive end of a $\frac{3}{8}$" drive $\frac{1}{2}$" socket to press centering washer in place. Throttle shaft should operate freely (Fig. 14).



1. Centering Washer
2. Socket

FIGURE 14—*Installation of Throttle Centering Washer.*

Install idle port rivet plug, idle adjustment spring, screw, and plug.

Install all passage plug rivets.

Install low speed jet, pump discharge ball check, spring and plug, and metering rod jet.

Install pump intake check ball and rivet plug in the diaphragm housing.

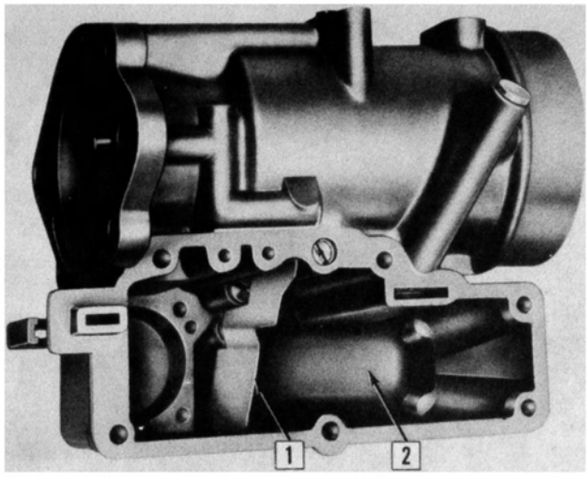
Assemble pump diaphragm and metering rod unit (see Fig. 10).

Be sure discharge hole in the diaphragm aligns with passage in diaphragm housing. Install four diaphragm housing attaching screws in the diaphragm housing through the holes in the diaphragm so that it is held against the housing smoothly. This is important to prevent tearing or damaging the diaphragm when installing the unit in the bowl: Install the fuel bowl baffle plate (see Fig. 15 for positioning).

Install the pump diaphragm and metering rod unit assembly in the fuel bowl. Tighten the screws uniformly.

Install choke piston housing gasket (Fig. 12) and housing.

Assemble fast idle cam, spring, and choke piston on choke shaft.



1. Bowl Baffle
2. Bowl

FIGURE 15—*Bowl Baffle Position.*

Install choke shaft, fast idle cam, and piston assembly in air horn. If the choke shaft binds, loosen the choke housing attaching screws and align the housing. Tighten screws.

Install choke valve; use new screws. Position choke valve so the Carter trademark (C) is visible from the closed choke position. Before tightening the choke valve screws, tap the valve lightly to be sure it is seated in the air horn. The valve or shaft must not bind in any position.

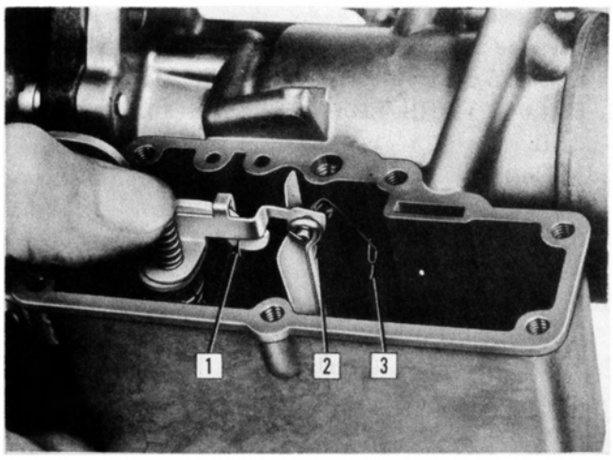
Install the flange assembly and gasket on the carburetor body. Be sure the gasket passage holes are aligned with the body and flange passages.

Install pump connector link and throttle shaft arm assembly.

Install fast idle link and choke connector rod.

Metering Rod Adjustment

This adjustment is important and must be checked each time the carburetor is reassembled or lean rods are installed. With throttle valve seated in bore of carburetor, press down on upper end of diaphragm shaft until diaphragm bottoms in bowl. Metering rod must contact bottom of metering rod well and metering rod arm must contact lifter link between springs and supporting lug. Adjust by bending metering rod arm at undercut positions (use tool T-109-22). After completing metering rod adjustment, be sure to hook metering rod spring on metering rod (Fig. 16).



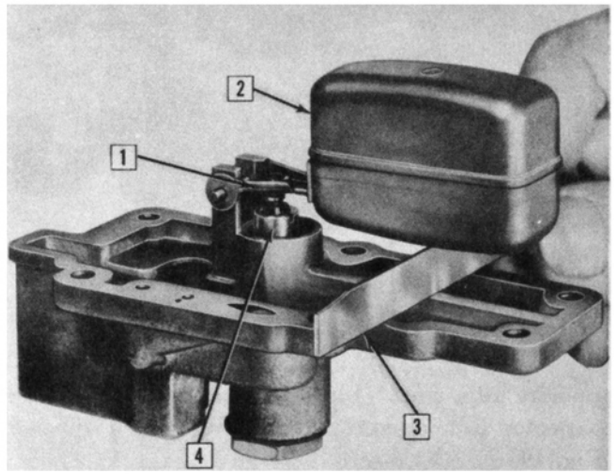
1. Bend Here to Adjust
2. Metering Rod Eye
3. Metering Rod Spring

FIGURE 16—*Metering Rod Adjustment.*

Install intake needle and seat assembly, float, and float pin. Be sure stop shoulder on float pin is toward outside of bowl.

Float Adjustment

With bowl cover assembly inverted and held level at eye height, with bowl cover gasket removed, the float will rest on pin in seated needle. The distance from the bowl cover to the top of float measures ⅜″ (Carter gauge T-109-80). Adjust by bending float lever. Do not depress float lip against spring loaded pin in needle; let float rest of its own weight while gauging.



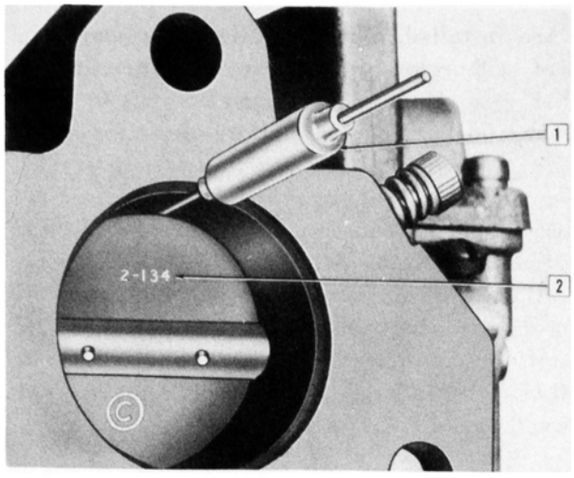
1. Float Lever
2. Float
3. Gauge T-109-80 (⅜″)
4. Needle and Seat Assembly

FIGURE 17—*Float Adjustment.*

Install bowl cover gasket, bowl cover assembly, strainer, strainer nut, and gasket assembly.

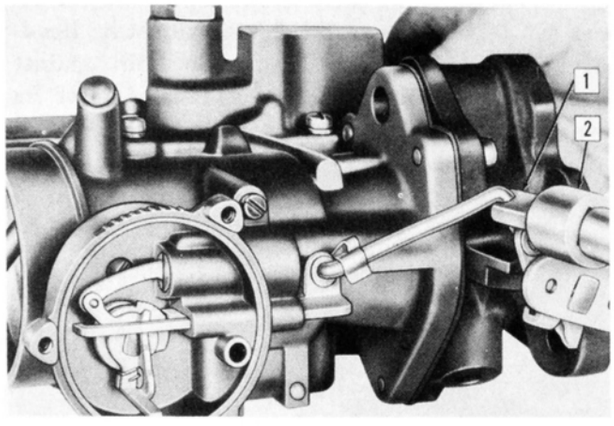
Fast Idle Adjustment

With thermostatic coil housing, gasket, and baffle plate removed, open throttle valve partially, close choke valve, then close throttle valve. This will allow the fast idle cam to revolve to fast idle position. With the choke valve held tightly closed and slight tension on the throttle lever, there should now be .033″ clearance. Use gauge T-109-29 between throttle valve and bore of carburetor side



1. Gauge T-109-29
2. Throttle Valve

FIGURE 18—Fast Idle Adjustment Gauge Location.



1. Bend Here
2. Tool T-109-213

FIGURE 19—*Bending Connector Rod to Obtain Proper Fast Idle.*

opposite idle port (Fig. 18); adjust by bending connector link at lower angle with tool T-109-213 (Fig. 19).

Unloader Adjustment

Must be made after fast idle adjustment. Hold throttle valve in wide open position and close choke valve as far as possible, by hand, without forcing. There should be 3/16" clearance between lower edge of choke valve and wall of air horn; use gauge T-109-28. Adjust by bending choke shaft unloader arm (Fig. 20); use tool T-109-105.

Install baffle plate, gasket, and climatic control coil and housing assembly. Set climatic control to one point lean from index (see Fig. 8).

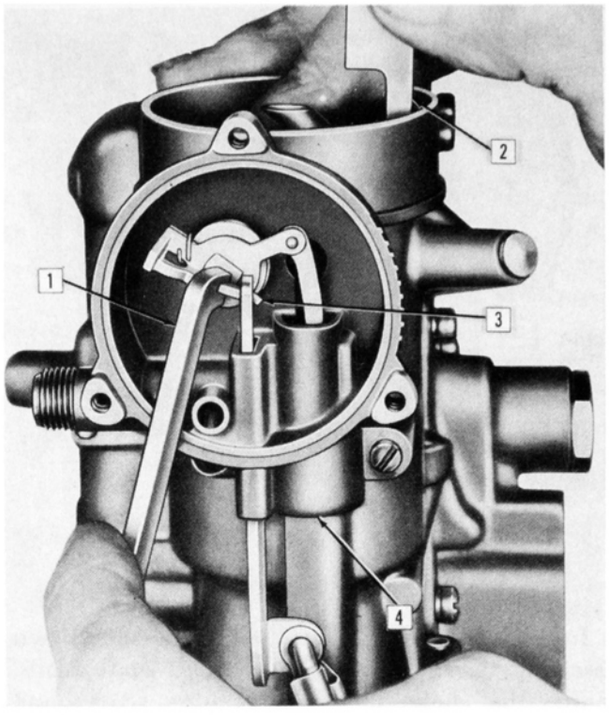
Carburetor Specifications

"Ambassador" Series ("YH" 895-S)

Dimensions:

Flange size, 1¼", 3 bolt.

Primary venturi, 11/32" I.D.



1. Tool T-109-105
2. Gauge T-109-28
3. Bend Here
4. Welch Plug in Opening to Vacuum Piston Housing

FIGURE 20—*Unloader Adjustment.*

Secondary venturi, 11/16" I.D.

Main venturi, 15/16" I.D.

Float Level:

Distance from float (at free end) to float chamber cover, with free weight of float on needle and spring to be 3/8".

Vents:

Outside none. Inside balance vent to air horn ahead of choke valve.

Gasoline Intake:

Square vertical, spring loaded needle. Size No. 46 drill in needle seat.

Low Speed Jet Tube:

Jet size No. 70 (.028") drill. By-pass in body, size 1.25 MM (.0492") drill. Idle bleed size No. 58 (.042") drill. Economizer, size No. 54 (.055") drill.

Idle Ports:

Upper port slot type:

Length .162"

Width .030"

Idle Port Opening:

Top of port: .124" to .128" above top edge of valve with valve tightly closed. Lower port size: .0615" to .0655" diameter (for idle adjusting screw).

Set Idle Adjustment Screw:

¾ to 1¾ turns open. For richer mixture, turn screw out. Do not idle engine below 550 R.P.M. For Hydra-Matic, idle engine at 375 R.P.M.

Main Nozzle:
In primary venturi, angle 35° off vertical. Discharge jet size: .086" inside diameter.
Metering Rod (Diaphragm Type):
Economy step, .078" diameter; middle step tapers to .0735" diameter; power step, .040" diameter. Length 2.922".
Metering Rod Jet:
.098" diameter.
Metering Rod Setting:
See adjustments.
Accelerating Pump:
Diaphragm type, vacuum and mechanically operated. Discharge (pump) jet size, No. 68 drill (discharges in nozzle passage). Intake ball check seat size, .115"-.120" diameter. Discharge ball check seat (in diaphragm housing) size .115"-.120" diameter. Vacuum passage restriction (in body) size No. 46 (.081") vacuum bleed (to throttle bore) size No. 65 drill.
Pump Stroke:
No adjustments.
Choke:
Carter climatic control, set one point lean. Butterfly type, offset choke valve.
Vacuum Spark Port:
Slot type. Size .125" by .041". Bottom of horizontal port .026" to .036" above top edge of valve in closed position.

CARBURETOR

"Statesman" and "Rambler" Series

"YF" 877-SA and "YF" 876-SA Climatic Control Carburetors

These carburetors have a vacuum control accelerator pump and metering rod assembly. The fuel bowls are vented to the air horn inlet giving correct fuel air ratio even when air cleaner becomes slightly restricted.

Float Circuit

The float circuit parts control the fuel level in the bowl of the carburetor. A supply of fuel is maintained for the low speed, high speed, pump and choke circuits. Setting the float to specifications assures an adequate supply of fuel in the bowl of the carburetor for all operating conditions.

The float circuit consists of a float, float pin, air horn gasket, and needle and seat assembly. Worn needle and seats must be replaced. These are supplied only in matched sets.

The float adjustment is conventional; however, when assembling the float and float pin, the stop shoulder on the float pin must be on the side away from the bore of the carburetor. Remove the air horn gasket before adjusting the float. Use a new air horn gasket to insure a seal between the air horn and the carburetor body each time the air horn is removed. Correct float level setting is ½" (Fig. 22).

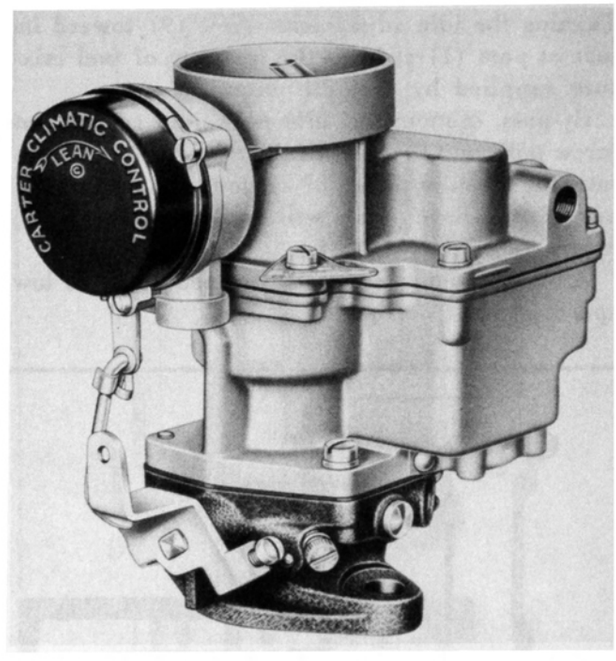


FIGURE 21—*Model "YF" 876-SA "Rambler" Series Carburetor.*

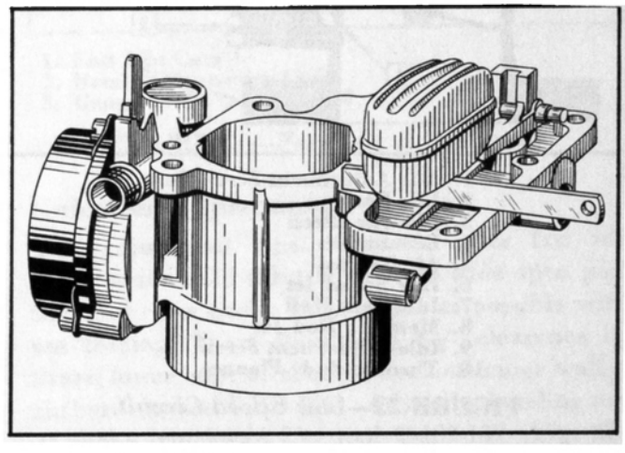


FIGURE 22—*Float Adjustment.*

Low Speed Circuit

Fuel for idle and early part throttle operation is metered through the low speed circuit (Fig. 23).

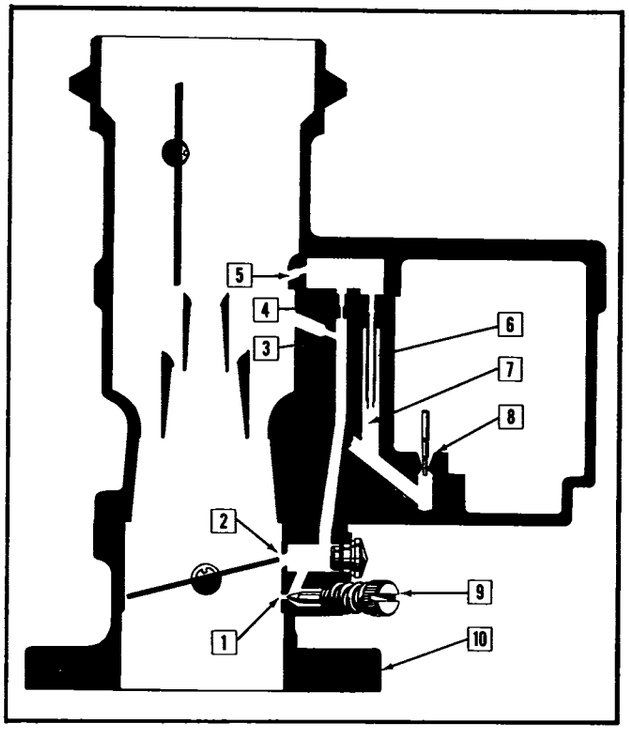
Liquid fuel enters the idle well (7) through the metering rod jet (8). The low speed jet (6) measures the amount of fuel for idle and early part throttle operation.

The air by-pass (5), economizer (4), and idle air bleed (3) are carefully calibrated orifices which serve to break up the liquid fuel and mix it with air as it moves through the passage to the idle port (2) and idle adjustment screw port (1).

Turning the idle adjustment screw (9) toward its seat in port (1) reduces the quantity of fuel mixture supplied by the idle circuit.

By-pass, economizer, idle port, idle adjustment screw port, and the bore of the throttle body flange must be clean and free of carbon. Obstructions at any of the above points will cause poor low speed engine operation.

A worn or damaged idle adjustment screw or low speed jet must be replaced.



1. Idle Adjustment Screw Port
2. Idle Port
3. Idle Air Bleed
4. Economizer
5. Air By-Pass
6. Low Speed Jet
7. Idle Fuel Well
8. Metering Rod Jet
9. Idle Adjustment Screw
10. Throttle Body Flange

FIGURE 23—*Low Speed Circuit.*

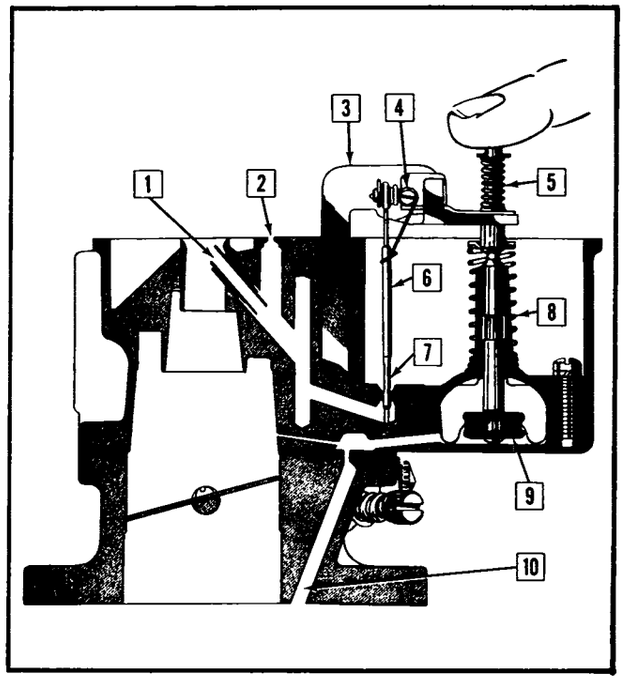
High Speed Circuit

Fuel for part and full throttle operation is supplied through the high speed circuit (Fig. 24).

The metering rod and metering rod jet (6 and 7) control the amount of fuel admitted to nozzle (1). The metering rod is both mechanically and vacuum controlled and is attached to the metering rod arm assembly (4). During part throttle operation, the vacuum in the accelerating pump chamber pulls the diaphragm assembly down holding the metering rod assembly against the pump lifter link (3). Movement of the metering rod is controlled by the pump lifter link which is attached to the throttle shaft of the carburetor. This is true at all times that vacuum in the diaphragm chamber is strong enough to overcome the tension of the pump diaphragm spring (8). Upper pump spring (5) serves as a bumper upon deceleration and a delayed action spring on acceleration.

Under any operating conditions, when the pump diaphragm spring overcomes the vacuum in the diaphragm chamber, the metering rod will move toward the wide open throttle or power position.

The nozzle (1) and the anti-percolator air bleed (2) are pressed in place and should not be removed.



1. Nozzle
2. Anti-Percolator Air Bleed
3. Pump Lifter Link
4. Metering Rod Arm Assembly
5. Upper Pump Spring
6. Metering Rod
7. Metering Rod Jet
8. Pump Diaphragm Spring
9. Diaphragm Assembly
10. Vacuum Passage to Manifold

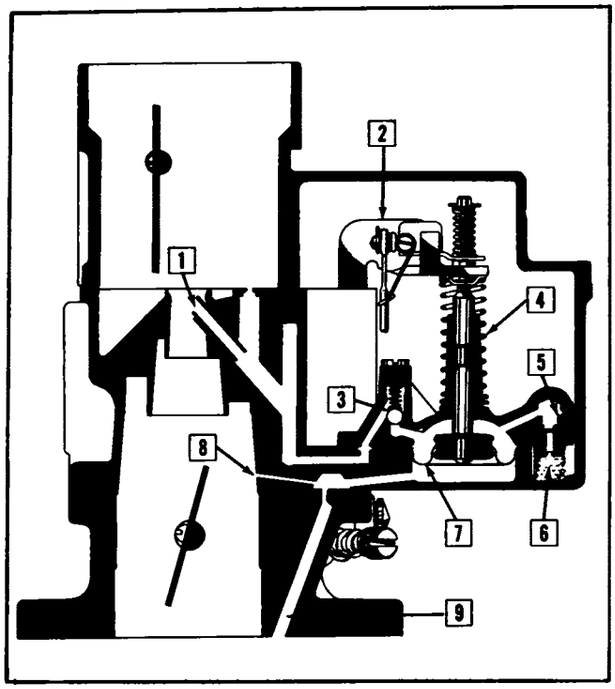
FIGURE 24—*High Speed Circuit.*

Metering Rod Adjustment

This adjustment is important and should be checked each time the carburetor is reassembled. With throttle valve seated in bore of carburetor, press down on upper end of diaphragm shaft, Figure 24, until diaphragm bottoms in vacuum chamber. Metering rod arm should contact lifter link at the same time metering rod bottoms in metering rod well. Before making adjustment, be sure flat on metering rod arm is parallel with flat of pump link arm. Adjust by bending lip up or down.

Accelerating Pump Circuit

The accelerating pump circuit receives its fuel supply from the bowl through the inlet check valve



1. Nozzle
2. Pump Lifter Link
3. Discharge Ball Check Valve
4. Pump Diaphragm Spring
5. Inlet Check Valve
6. Intake Strainer Screen
7. Pump Diaphragm
8. Vacuum Bleed
9. Vacuum Passage to Manifold

FIGURE 25—*Accelerating Pump Circuit.*

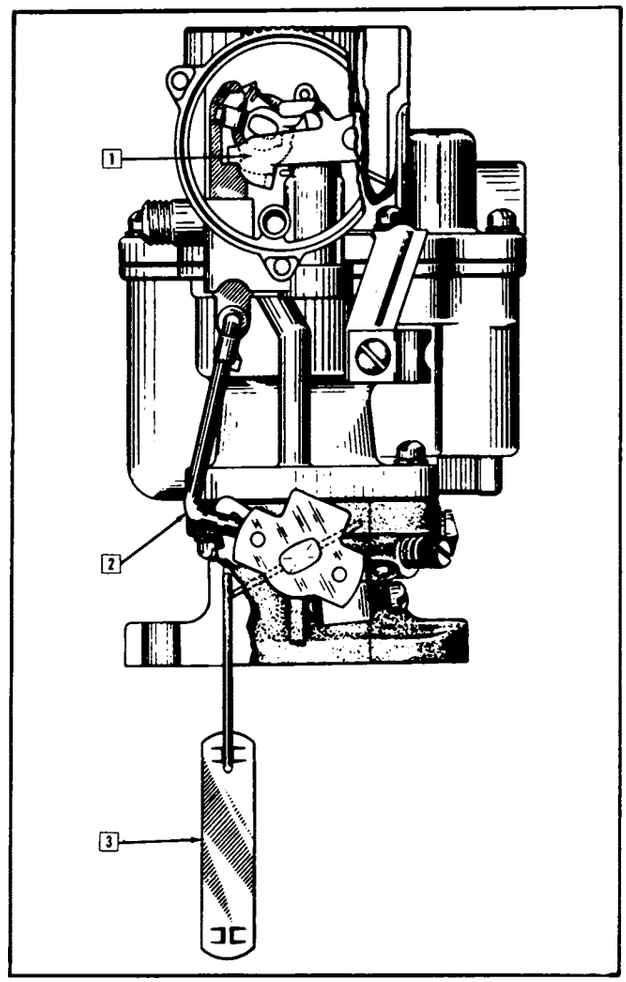
at point (5). From this valve, it fills the diaphragm chamber. When the throttle valve is opened, pump lifter link tends to pull diaphragm assembly upward; first shock of movement is absorbed by small pump bumper spring located above pump lifter link. As vacuum decreases, pump diaphragm spring plus mechanical lift on lifter link, forces fuel through discharge check valve (3) and passage over into main nozzle passage, to enrich main circuit fuel for acceleration (Fig. 25).

During recalibration, all parts must be cleaned and passages blown out with compressed air.

NOTE: *When engine is not operating, the pump through the mechanical linkage delivers about one-half of its capacity.*

Fast Idle Adjustment

Remove the thermostatic coil housing, gasket, and baffle plate. Crack throttle valve and hold the choke valve firmly in the closed position; then close the throttle valve. This will allow the fast idle cam to revolve to the fast idle position. With the choke valve held tightly closed and slight tension on the throttle lever, there should be .054" clearance between the throttle valve and bore of carburetor (side opposite idle port). Adjust by bending connector link as shown in Figure 26. Use bending tool T-109-41.



1. Fast Idle Cam
2. Bend at Connector Link
3. Gauge (.054") T-109-193

FIGURE 26—*Fast Idle Adjustment.*

Unloader Adjustment

This adjustment must be made after fast idle adjustment. Hold throttle valve in wide open position and close choke valve as far as possible without forcing. There should be $^{9}/_{32}$" clearance between lower edge of choke valve and inner wall of air horn (gauge T-109-126). Adjust by bending arm of choke trip lever. Use tool T-109-187 (Fig. 27).

Specifications

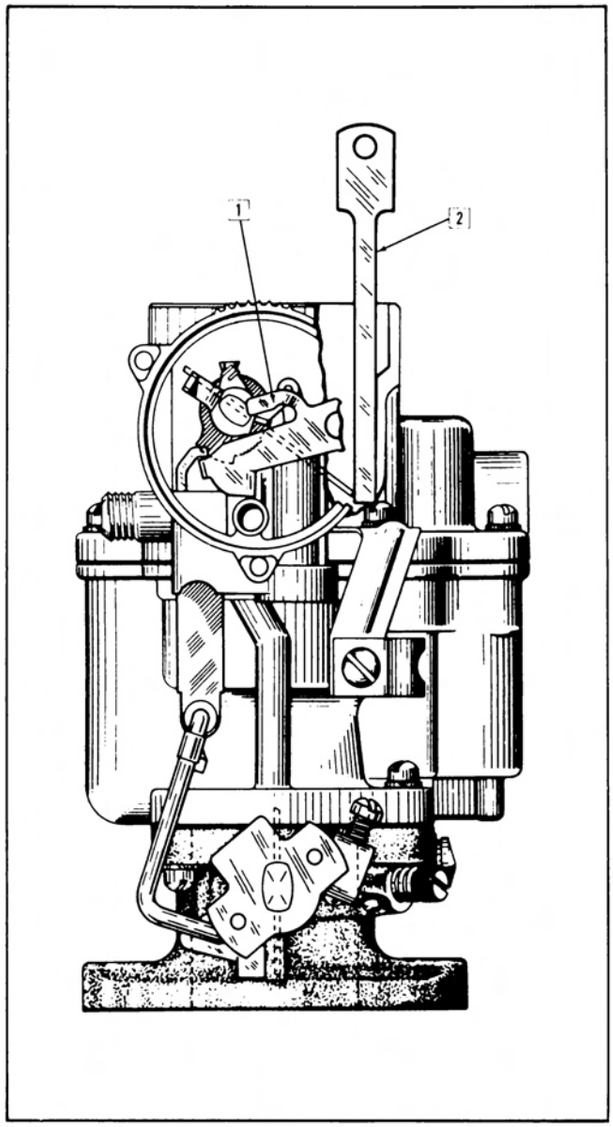
"Statesman" Series (YF-877-SA)
"Rambler" Series (YF-876-SA)

Dimensions: Flange size 1¼" SAE Primary venturi, $^{11}/_{32}$" (8.73 mm) I. D. Main venturi, 1¼" (31.75 mm) I. D.

Float Setting: Float adjustment (Fig. 22) ½".

Vents: Outside none. Inside balance vent to air horn above choke valve.

Gasoline Intake: Square vertical needle. Size No. 46 (2.06 mm) drill in needle seat.



1. Bend Here to Adjust
2. Gauge T-109-126

FIGURE 27—*Unloader Adjustment.*

Low Speed Jet Tube: Jet size, No. 70 (.71 mm) drill. By-pass in air horn size No. 55 (1.32 mm) drill. Bleed in body, size No. 52 (1.61 mm) drill. Economizer in body, size No. 53 (1.51 mm) drill.

Idle Port: Upper port slot type; length .200" (5.08 mm). Width .030" (.76 mm).

Idle Port Opening: Top of port: .142" to .146" (3.61 to 3.71 mm) above top edge of valve with valve tightly closed. Lower port size: .0615" to .0655" (1.56 to 1.66 mm) diameter. (For idle adjustment screw.)

Set Idle Adjustment Screw: ½ to 1½ turns open. For richer mixture, turn screw out. Do not idle engine below 550 RPM. For Hydra-Matic, idle engine at 375 RPM.

Main Nozzle: Nozzle is installed permanently. *Do not remove.* Anti-percolator air bleed: size .028" (.71 mm) diameter.

Metering Rod (Diaphragm Type): Economy step .078" (1.98 mm) diameter; middle step tapers to .07325" (1.86 mm) diameter: power step .047" (1.19 mm) diameter.

Metering Rod Jet: .10236" (2.6 mm) diameter.

Metering Rod Setting: See adjustments.

Accelerating Pump: Diaphragm type vacuum operated. Discharge through nozzle. Intake (ball check) size No. 40 (2.49 mm) drill. Vacuum restriction (in flange) size No. 55 (1.32 mm) drill. Vacuum passage (diaphragm bleed) size No. 65 (.89 mm) drill. Discharge (ball check) seat size No. 32 (2.95 mm) drill in diaphragm housing. Discharge restriction (in housing) No. 65 (.89 mm) drill.

Pump Adjustment: None.

Choke: Carter climatic control set one point lean. Valve: Offset butterfly type. Choke heat suction hole: restriction in body size, No. 46 (2.06 mm) drill.

Vacuum Spark Port: Round type. Size .040" (1.02 mm) diameter. Bottom of port .021"-.029" (.53 to .74 mm) above top edge of valve in closed position.

EXHAUST SYSTEM

"Ambassador" Series

The exhaust pipe is clamped to the left side of the engine and forms a "U" around the front of the engine.

It then passes down the right side of the engine compartment, toward the rear, to the muffler.

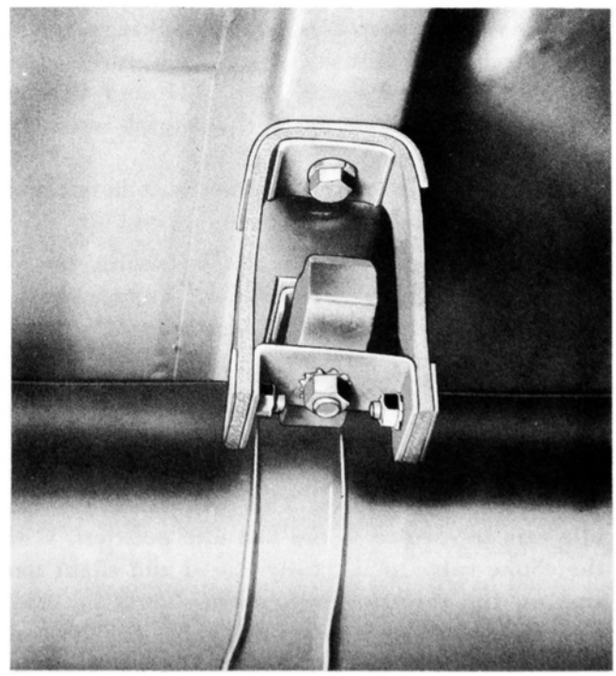


FIGURE 28—*Muffler Support "Ambassador" Series Shown.*

"Statesman" and "Rambler" Series

The exhaust pipe is clamped to the right side of the engine and then passes down, toward the rear, to the muffler.

All Series

Prior to removing the exhaust pipe from the engine, mark the pipe adjacent to the exhaust pipe clamps with a scribe to insure correct alignment at time of assembly. Do not over tighten the clamp nuts as the exhaust pipe expands from the heat of operation.

Mufflers

"Ambassador" and "Statesman" Series

The mufflers are of the oval type which efficiently utilize less space under the body floor. The mufflers are supported by straps and cushioned with rubber to eliminate the transmission of exhaust vibration to the body (Fig. 28).

"Rambler" Series

The muffler is a tubular type supported by a rubber cushion.

TAIL PIPES

The tail pipes are designed to conform with the contour of the body floor, thus providing clearance between the pipe and the under carriage. The tail pipe is supported at the rear with a cushion type support (Fig. 29).

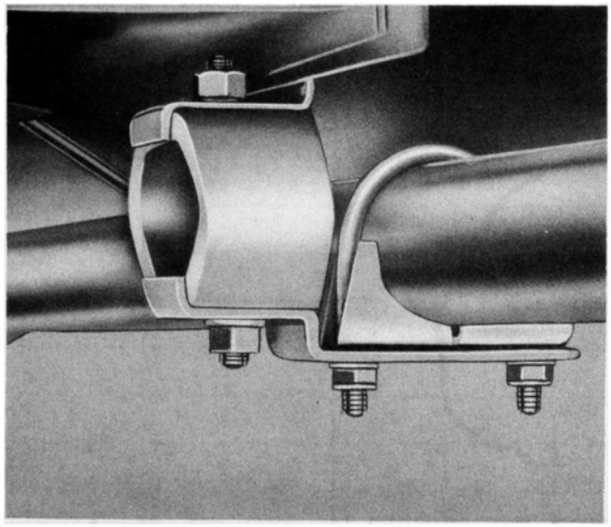
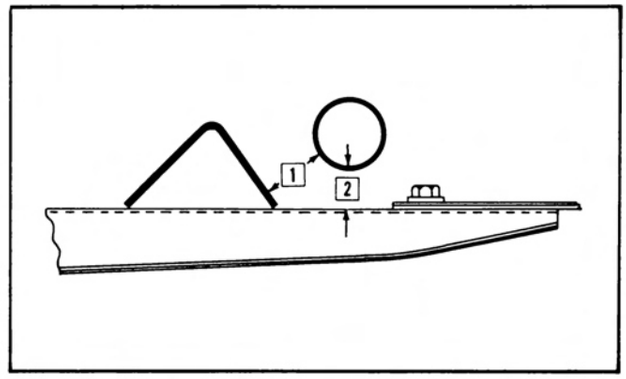


FIGURE 29—*Tail Pipe Support.*

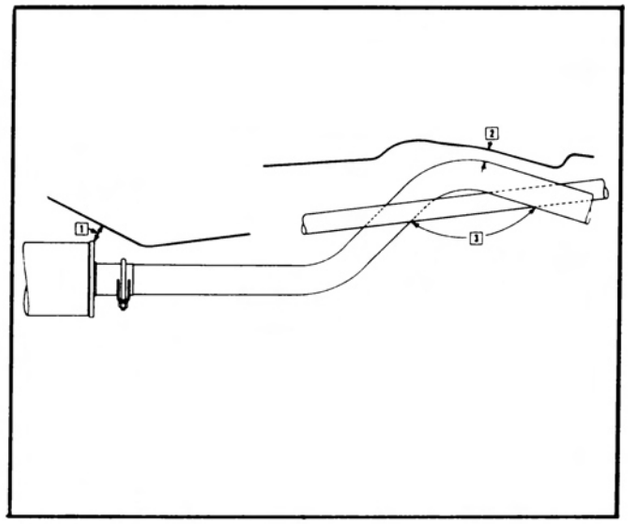
"Ambassador" and "Statesman" Series

When installing the tail pipe, adjust it to maintain sufficient clearance from the underbody and running gear (Figs. 30, 31, 32, and 33). All dimensions are approximate. Tail pipe to truss rod and tail pipe to track bar clearances must be checked with the rear springs fully compressed and then fully extended.



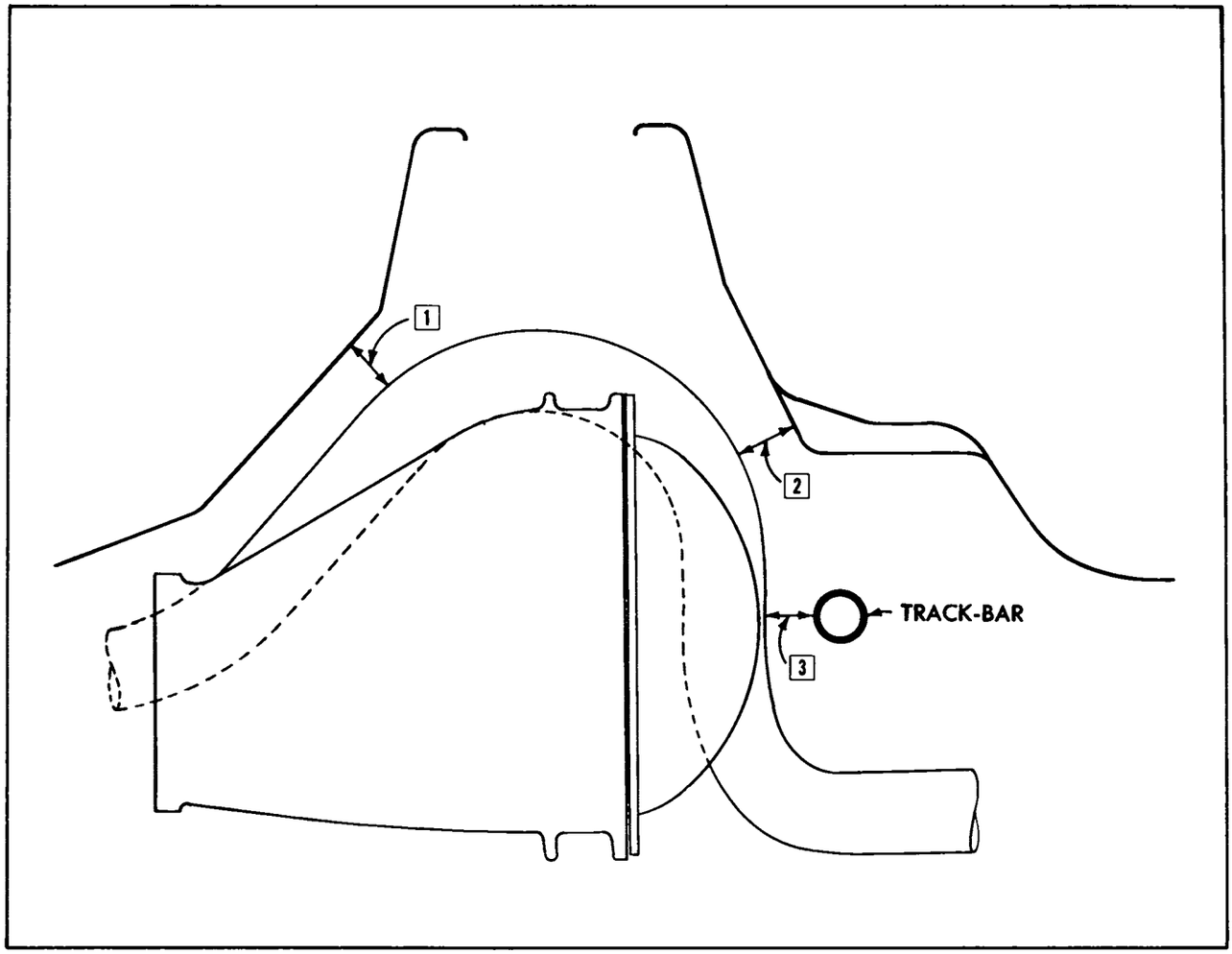
1. "Ambassador" 1¾"
   "Ambassador" With Hydra-Matic ¾"
2. "Ambassador" 1"

FIGURE 30—*Exhaust Pipe Clearance at Rear Engine Mounting Bracket and Cross Member.*



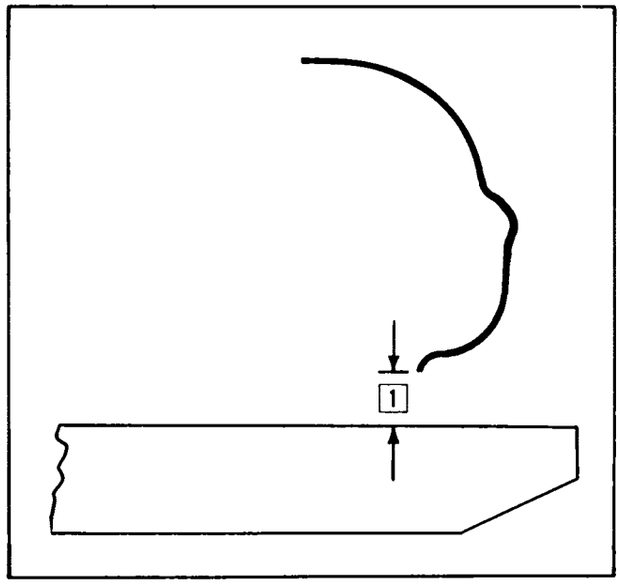
1. "Ambassador" 1⅛"
   "Statesman" 1 1/16"
2. "Ambassador" ¾"
   "Statesman" ⅞"
3. Provide Clearance at Truss Rod and Tail Pipe With Rear Springs Fully Compressed and Then Fully Extended

FIGURE 31—*Clearance Between Underbody and Muffler and Tail Pipe.*



1. "Ambassador" 1¼"
   "Statesman" 1⅝"
2. "Ambassador" 1½"
   "Statesman" 1⁹⁄₁₆"
3. "Ambassador" 1⅛"
   "Statesman" 1"

FIGURE 32—*Tail Pipe Clearance Over Rear Axle and Adjacent to Track Bar.*



1. "Ambassador" 13⁄16"
   "Statesman" 1⁄16"

FIGURE 33—*Tail Pipe Clearance at Bumper Rail.*

TECHNICAL SERVICE LETTER REFERENCE

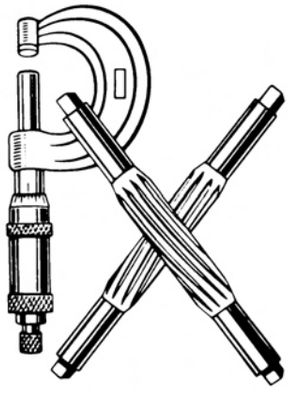
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TECHNICAL SERVICE LETTER REFERENCE

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TECHNICAL SERVICE MANUAL



CLUTCH SECTION

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CLUTCH

CLUTCH SECTION

The clutch is a single plate, dry disc type. A steel cover bolted to the flywheel contains the clutch drive plate, the pressure plate, clutch levers, and springs (Fig. 1).

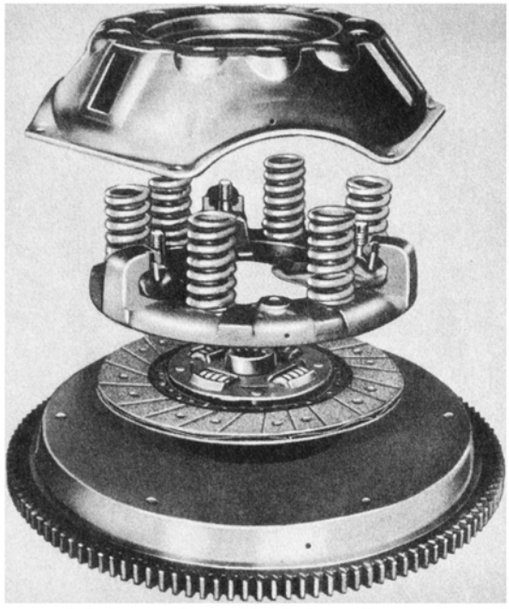


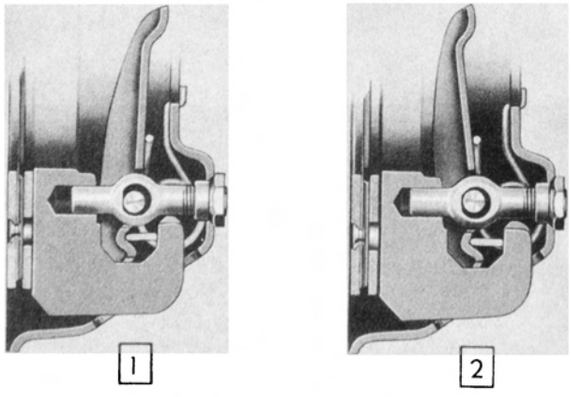
FIGURE 1—*Component Parts of Clutch.*

The clutch drive plate is spring cushioned with a facing riveted to both sides. The coil springs around the hub absorb the power shocks and cushion the driving mechanism.

The clutch throw-out bearing is of the ball type, packed at time of manufacture, and requires no further lubrication.

No adjustment for wear is provided in the clutch itself. An individual adjustment is built into the clutch cover to adjust the height of the release levers. This adjusting nut is locked in position and should never be disturbed unless the clutch assembly has been disassembled for the replacement of worn parts.

When the clutch pedal is depressed, the release bearing is moved toward the flywheel, and contacts the inner ends of the release levers. Each lever is pivoted on a floating pin which remains stationary in the lever and rolls across a short flat portion of the enlarged hole in the eyebolt. The outer ends of the eyebolts extend through holes in the stamped cover and are fitted with adjusting nuts to secure the levers in the correct position. The outer ends of the release levers engage the pressure plate lugs by means of fulcrums, which provide knife-edge contact between the outer ends of the levers and the lugs (Fig. 2).



1. Engaged Position
2. Released Position

FIGURE 2—*Clutch Lever.*

REMOVING THE CLUTCH ASSEMBLY

Always mark the clutch cover, pressure plate, and flywheel on original production assemblies before removing, so that when they are reassembled they will be in their same relative positions (Fig. 1).

CAUTION: *When removing the clutch cover from the flywheel, loosen each cap screw a few turns until the spring tension on the cover has been released. The clutch cover is a steel stamping which could be sprung by incorrect removal, resulting in clutch chatter when reused.*

CRANKSHAFT PILOT BUSHING

When a clutch assembly is removed from the flywheel, always inspect the crankshaft pilot bushing for scoring or loose condition. If replacement is required, use clutch pilot bushing removing tool (J-1418-A). To provide initial lubrication for this bushing, coat lightly with a short fiber, medium wheel bearing grease.

CLUTCH DISASSEMBLY

The clutch cover and pressure plate are under spring tension at all times. Therefore, care must

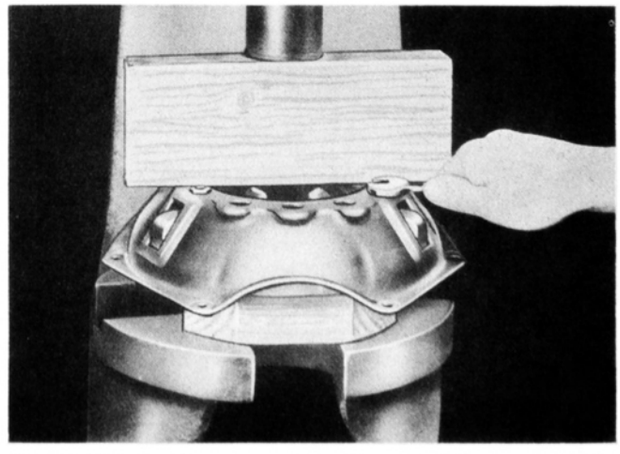


FIGURE 3—*Compress Springs to Remove Nuts.*

be exercised when a clutch cover assembly is disassembled. Place the clutch cover assembly in an arbor press with a hard wood block under the pressure plate. Have the block of such a length that the cover can move down and not interfere with the block. Place a wood block across the top of the cover so that it rests on the spring bosses and does not interfere with the eyebolt adjusting nuts (Fig. 3).

Compress the clutch cover in the press until the clutch release levers are free. Remove the adjusting nuts (Fig. 3). Release the press slowly to prevent the springs from flying out.

CAUTION: *When relieving the spring pressure, be sure the cover does not stick on the pressure plate bosses.*

Clutch Pressure Springs

A thorough inspection of the clutch springs should always be made. They should be tested for spring tension when the spring is compressed to a given length. (See Clutch Pressure Spring Specifications for the correct spring heights).

CLUTCH PRESSURE SPRING SPECIFICATIONS

Series	*No. of Springs*	*Compressed Length*
"Ambassador" Series	9	155# ±5 at $1\frac{13}{16}$"
"Statesman" Series	6	195# ±5 at $1\frac{7}{16}$"
"Rambler" Series	3	195# ±5 at $1\frac{7}{16}$"
	3	190# ±5 at $1\frac{7}{16}$"

Clutch Adjusting Levers

A thorough inspection should be given the levers, the eyebolt pin, and the fulcrum. If they show any wear, replace them.

To remove the release levers, grasp a lever and eyebolt between the thumb and fingers so that the inner end of the lever and the upper end of the eyebolt are as near together as possible. Keep the eyebolt pin seated in its socket in the lever (Fig. 4).

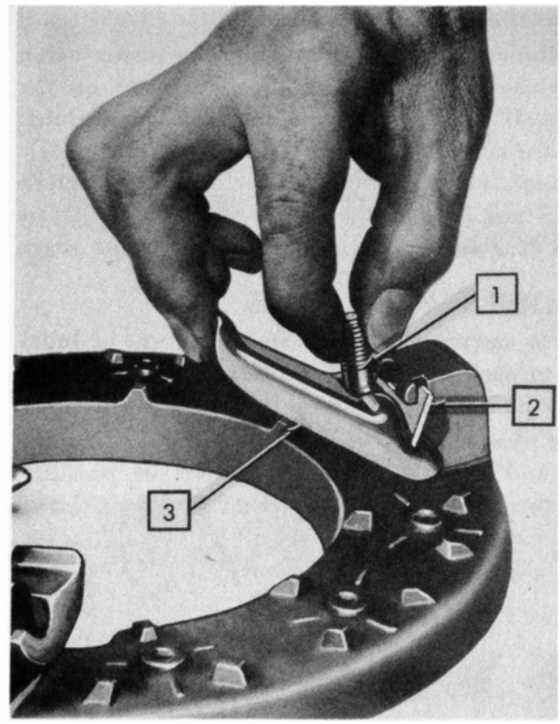
Lift the fulcrum over the ridge on the end of the lever. Lift the lever and eyebolt off the pressure plate (Fig. 5).

Clutch Pressure Plate

Inspect the pressure plate to make sure that it is not cracked or scored. Check on a surface plate for a warped condition, as a pressure plate out of alignment will result in clutch chatter.

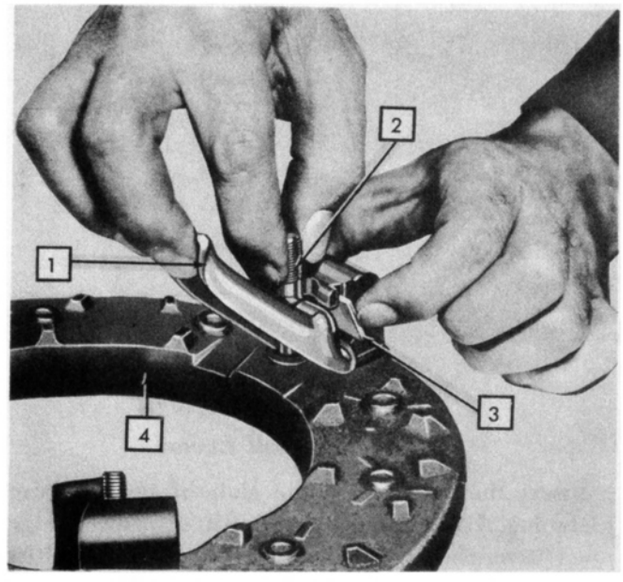
Flywheel Face

Inspect the condition of the flywheel as well as the pressure plate for any roughness. Check all flywheel stud nuts for tightness. Use a torque wrench and tighten the stud nuts 95 to 100 foot pounds torque on the "Ambassador" Series, and 50 to 55 foot pounds on the "Statesman" and "Rambler" Series.



1. Eyebolt
2. Fulcrum
3. Lever

FIGURE 4—*Remove Levers.*



1. Lever
2. Eyebolt
3. Fulcrum
4. Pressure Plate

FIGURE 5—*Lift Lever and Eyebolt off Pressure Plate.*

Transmission Clutch Shaft

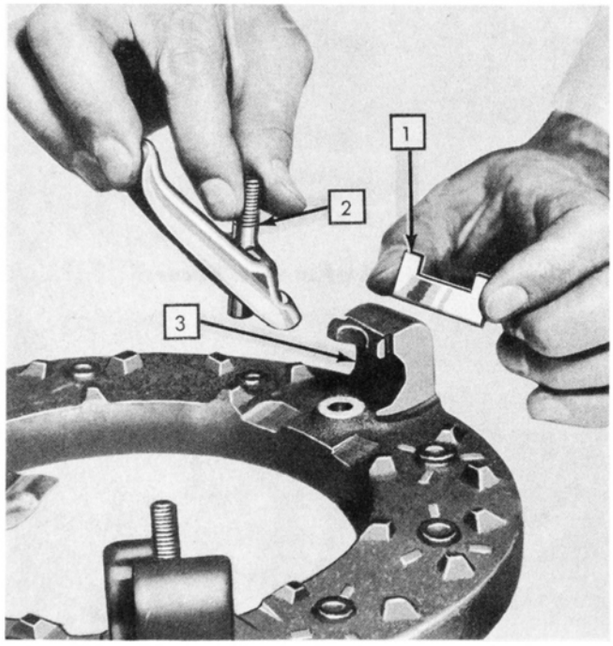
Slide the clutch driven plate onto the transmission clutch shaft to make sure that it is free on the splines. If the splines on the transmission clutch shaft are burred, remove the burrs with a fine file or stone. If the movement of the clutch driven plate is not free on the splines, the result will be clutch drag and hard shifting of transmission gears.

ASSEMBLY OF CLUTCH

Prior to assembly, apply a small amount of lubriplate to each side of the pressure plate lug.

Lay the pressure plate on the block in the press.

Assemble a lever, eyebolt, and pin holding the lever and eyebolt as close together as possible. With the other hand, grasp the fulcrum as shown in Figure 6.



1. Fulcrum
2. Eyebolt
3. Pressure Plate Lug

FIGURE 6—*Install Levers.*

Insert the fulcrum in the slots of the pressure plate lug. Lower slightly and tilt the lower edge until it touches the vertical milled surface of the lug. Insert the lower end of the eyebolt in the hole in the pressure plate. The short end of the lever will then be under the hook of the lug and near the fulcrum.

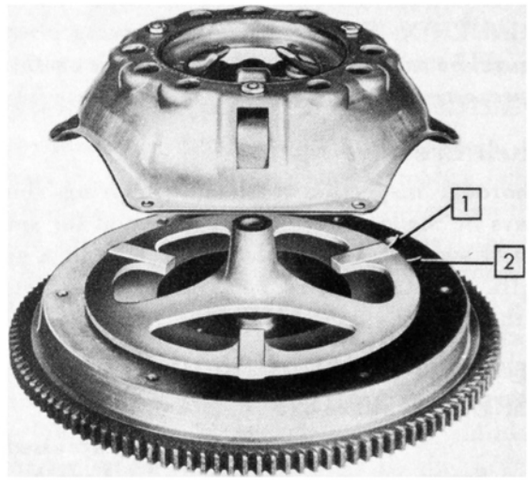
Slide the fulcrum upward in the slots of the lug. Lift it over the ridge on the short end of the lever and drop it into the groove in the lever (Fig. 6).

Assembly of Springs and Cover

(See Clutch Pressure Spring Specification.) After all levers are installed, place the clutch pressure springs in a vertical position on each spring boss. (In the "Statesman" and "Rambler" Series clutch, the center spring boss in each group is not used.)

Check the anti-rattle springs in the clutch cover and place the cover on top of the pressure plate assembly. The top of each pressure spring must enter its spring seat in the cover. (Line up punch marks on cover and pressure plate for balance) (Fig. 1).

Slowly compress the cover making sure that the eyebolts and pressure plate lugs are guided through the proper holes in the cover.



1. Machined Land
2. Gauge Plate

FIGURE 7—*Clutch Gauge Plate (J-1507).*



FIGURE 8—*Each Lever Should be Depressed Several Times to Settle all Parts in Their Proper Positions.*

Hold the clutch under compression and screw down the adjusting nuts until they are flush with the tops of the eyebolts. Release the spindle of the press.

CLUTCH LEVER ADUSTMENT

IMPORTANT: *Always inspect release lever height adjustment when installing a new or relined clutch drive plate.*

Place the clutch gauge plate (J-1507) on the flywheel in the position normally occupied by the driven plate. Mount the cover assembly, center the plate, and line up the three machined lands on the gauge plate directly under the levers (Fig. 7).

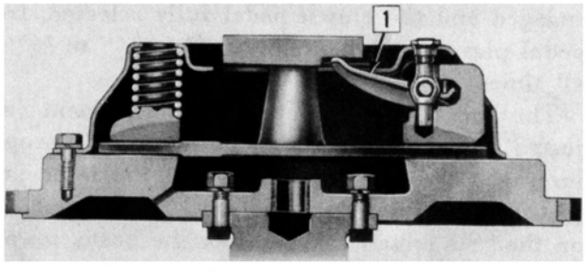
Tighten the cover screws in rotation, one to two turns at a time, to avoid distortion of the cover.

Each lever should be depressed several times before checking. This will seat the levers in their operating positions (Fig. 8).

"Statesman" and "Rambler" Series

The lever height adjustment of the clutch plate is 1/32" above the center hub of the tool (J-1507).

Place the gauge on the hub (Fig. 9) so that the offset of the gauge is 1/32" above the hub as shown. To check the lever, turn the lever adjusting nut until the lever is flush with the underside of the gauge. Adjust the other two levers in the same manner.



1. 1/32" Above Hub

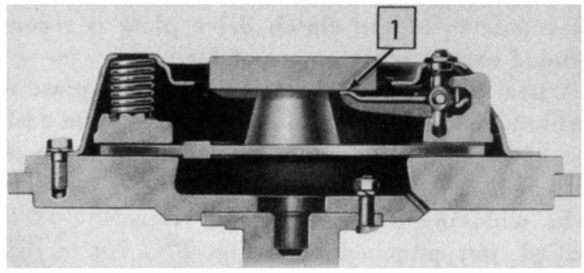
FIGURE 9—*"Statesman" and "Rambler" Series Clutch Lever Height.*

"Ambassador" Series

The lever adjustment is made in the same manner as on the "Statesman" and "Rambler" Series but with the straight side of the gauge down so that the levers are adjusted flush with the hub (Fig. 10).

Locking Adjusting Nuts

Before staking the adjusting nuts to lock them in place, work the lever up and down and recheck lever adjustment again. Stake the nut with a dull punch (Fig. 11).



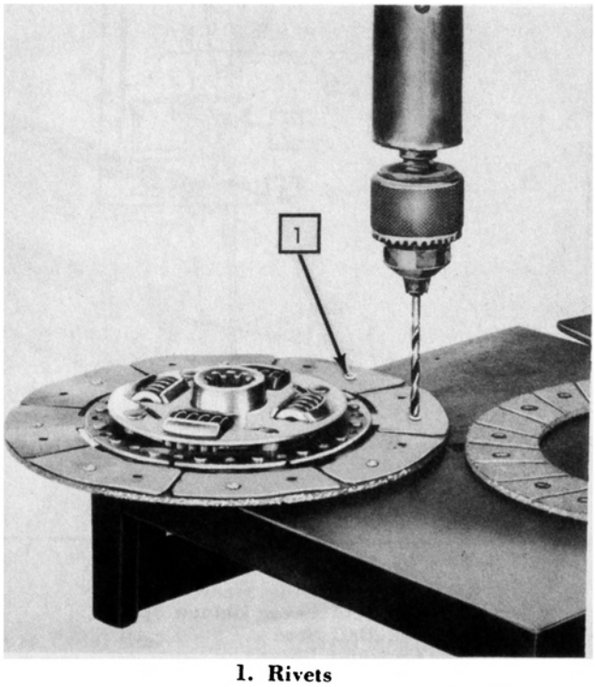
1. Flush With Hub

FIGURE 10—*"Ambassador" Series Clutch Lever Height.*



1. Adjusting Nuts

FIGURE 11—*Locking Adjusting Nuts*



1. Rivets

FIGURE 12—*Drill Out Rivets.*

Clutch Drive Plate

No repairing of the clutch drive plate is recommended except replacement of facings.

A new plate should be installed if the plate or cushion springs appear to be defective. The cushion springs must not be bent out of shape or flattened.

In removing old facings, the rivets should be drilled, not punched out (Fig. 12). Use a drill size that will cut out the roll of the rivet.

To assemble facings, place one facing on the flywheel side of the drive plate. Line up the countersunk holes with rivet holes in the cushion spring.

Rivet each cushion spring to the facing before installing the other facing. Roll the rivets against the cushion spring. Do not split them.

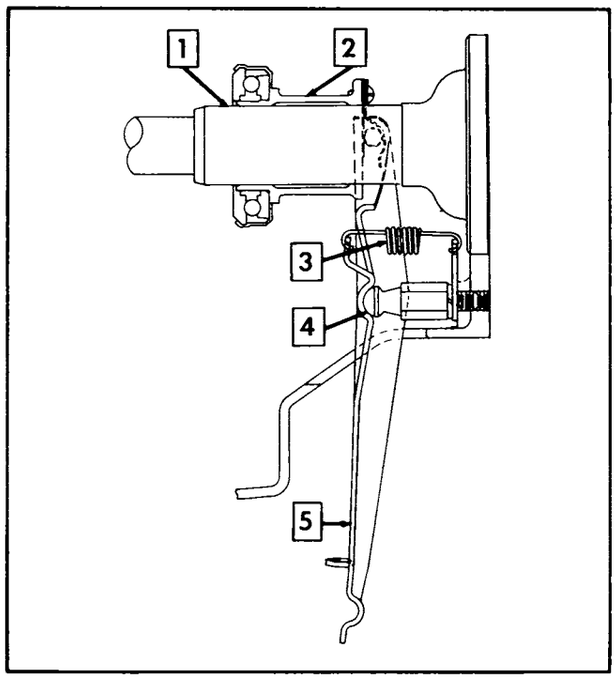
CLUTCH INSTALLATION

In order to install the clutch drive plate and clutch cover assembly, use aligning tool J-1435 or J-1625.

This tool aligns the clutch drive plate so that the transmission clutch shaft will enter easily. Make sure that the clutch pedal is not depressed until the transmission has been installed as the plate will drop out of alignment position.

CLUTCH THROW-OUT RELEASE BEARING

The clutch throw-out or release mechanism consists of a forked lever which pivots on a ball stud threaded into the clutch housing. A throw-out lever return spring, as shown in Figure 13, is anchored to a clip under the ball stud and holds the lever in contact with the ball stud. The clutch throw-out bearing, which is a pre-lubricated unit, is attached to the forked end of the throw-out lever.



1. Transmission Front Bearing Cap
2. Release Bearing Sleeve Assembly
3. Throw-out Lever Return Spring
4. Pivot Ball Stud
5. Throw-out Lever

FIGURE 13—*Clutch Release ("Ambassador" Series Shown).*

Never wash the clutch throw-out release bearing in gasoline or any solvent that will dissolve the lubricant. It is neither necessary nor possible to lubricate these bearings at any time.

CLUTCH PEDAL LINKAGE

A beam type clutch release linkage is used in all series. The "Ambassador" and "Statesman" Series is similar in design (Fig. 14).

The "Rambler" Series beam type clutch operates on the same principle, but the design differs as shown in (Fig. 16).

The "Ambassador" and "Statesman" Series adjustment for free pedal play is made by varying the length of the beam to the throw-out lever rod (Item 2, Fig. 14). Lengthening this rod reduces the free pedal play. Shortening the rod increases the pedal play.

The "Rambler" Series adjustment for free pedal play is made by varying the length of the beam to throw-out lever adjusting link (Item 4, Fig. 16). Lengthening this link increases free pedal play. Shortening the link reduces pedal play.

In order to provide sufficient free movement of the clutch throw-out bearing when the clutch is engaged and the clutch pedal fully released, free pedal play should be maintained at ½" to ¾" at all times.

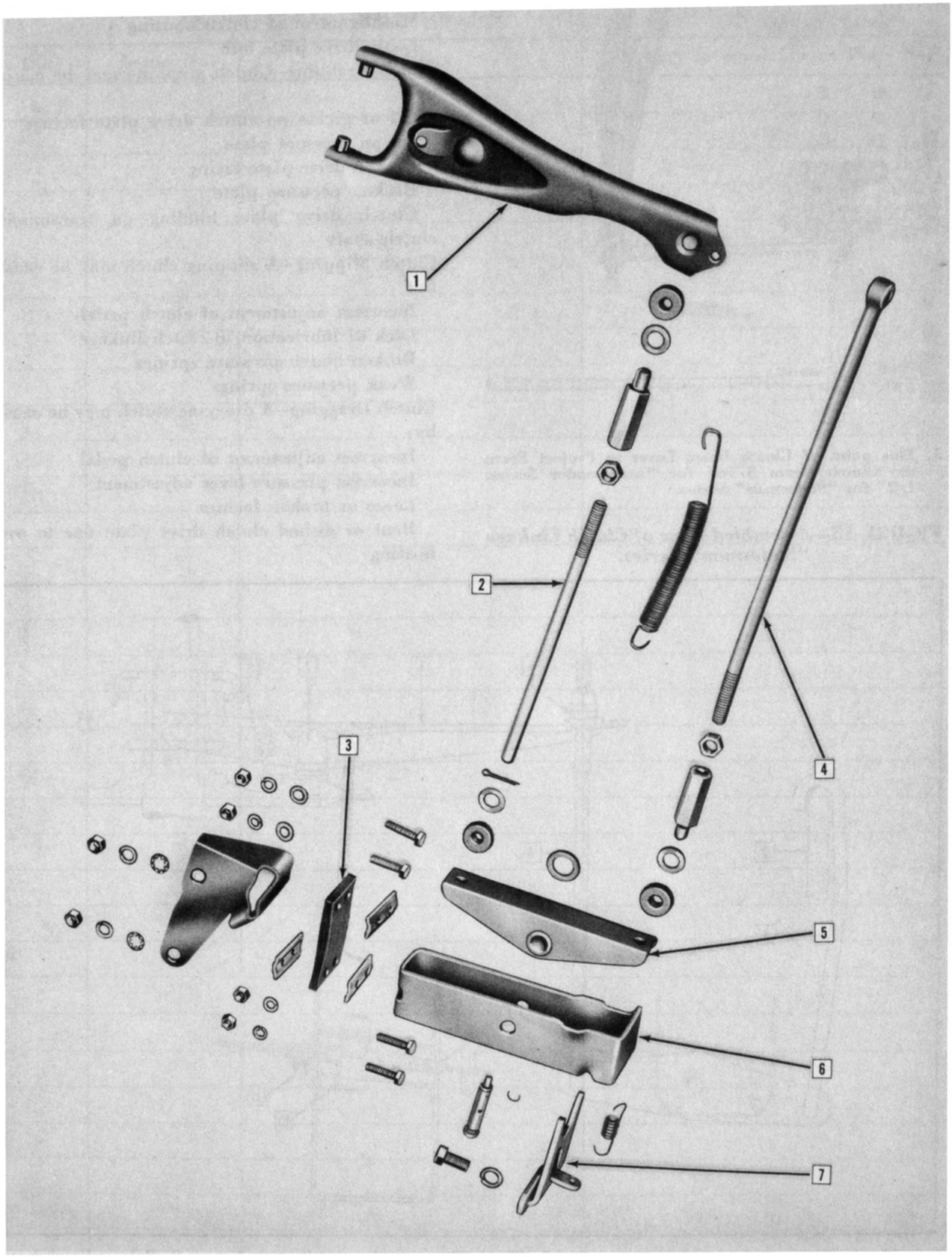
The clutch pedal to beam rod adjustment (adjusted in production) is made to provide proper leverage so that the outer end of the lever projects 5/16" on the "Ambassador" Series, and ½" on the "Statesman" Series from the beam, toward the rear, with the clutch pedal against the floor board. The pedal to beam rod should never be disturbed in service (See Figure 15).

To lubricate the linkage, disconnect the throw-out lever spring and apply lubriplate to the ends of the pedal rod and lever rod. The clutch beam lever pivot pin is pressure lubricated; the lubricating fitting is located at the bottom of the pin. Lubricate the clutch beam at 1,000 mile intervals.

CLUTCH DIAGNOSIS

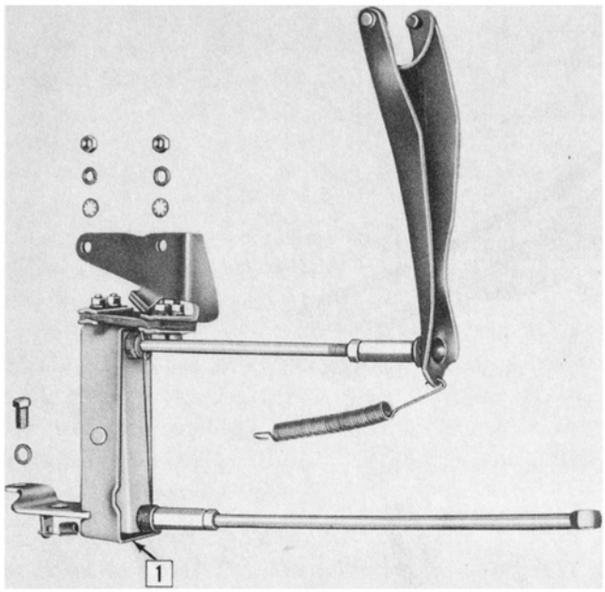
Clutch Chatter—Chatter may be caused by:

Grease on the clutch drive plate facings
Binding of the clutch linkage
Loose or damaged clutch drive plate facings
Loose engine mountings



1. Clutch Throw-out Lever
2. Clutch Beam to Throw-out Lever Rod
3. Clutch Beam Insulator
4. Clutch Beam to Pedal Rod
5. Clutch Beam Lever
6. Clutch Beam
7. Clutch Beam Fulcrum Plate

FIGURE 14—*Clutch Linkage "Statesman" Series.*



1. This point of Clutch Beam Lever to Project From the Clutch Beam 5/16″ for "Ambassador Series, 1/2″ for "Statesman" Series.

FIGURE 15—*Assembled View of Clutch Linkage "Statesman" Series.*

Incorrect adjustment of clutch pressure levers
Mis-alignment of clutch housing
Loose drive plate hub

Clutch Grabbing—Clutch grabbing may be caused by:

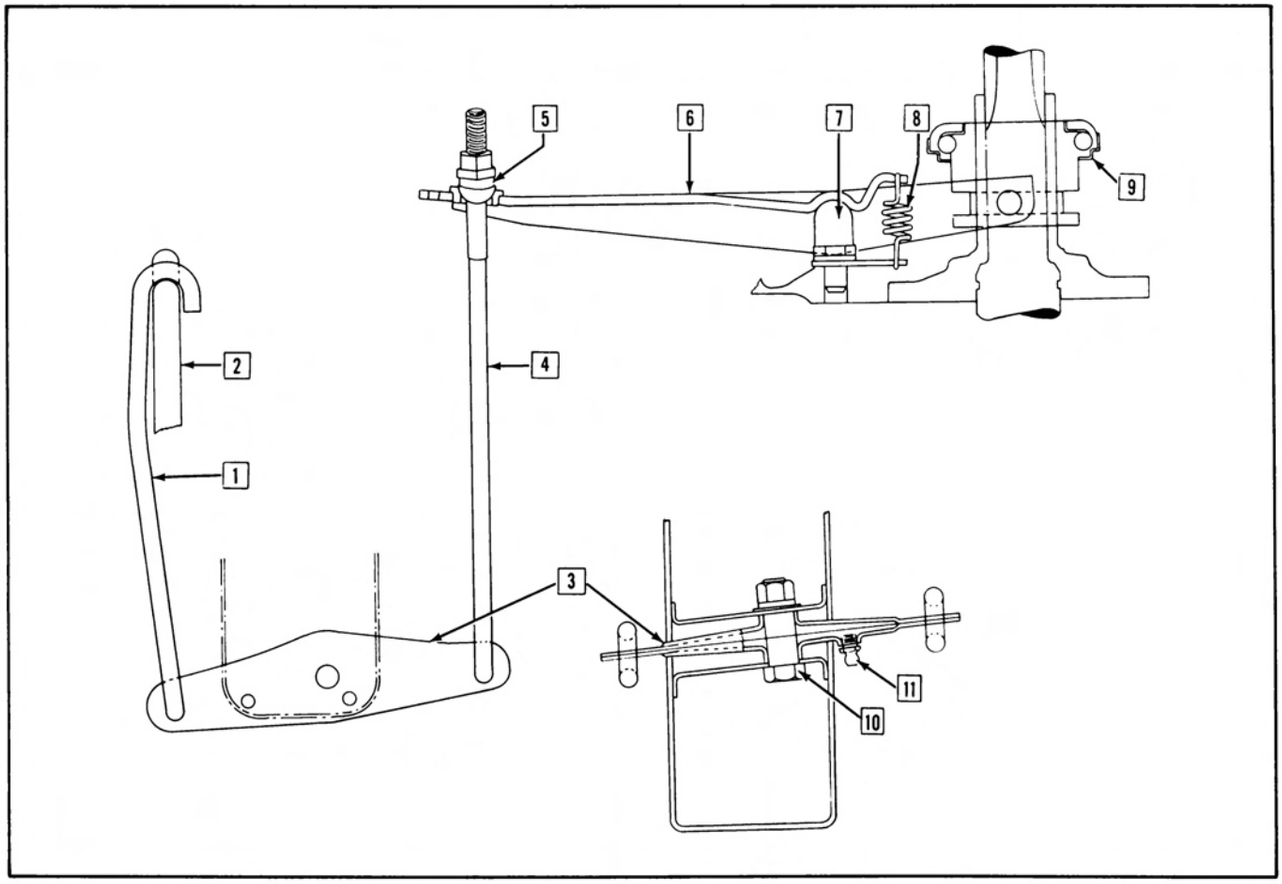
Oil or grease on clutch drive plate facings
Oil on pressure plate
Broken drive plate facing
Broken pressure plate
Clutch drive plate binding on transmission clutch shaft

Clutch Slipping—A slipping clutch may be caused by:

Incorrect adjustment of clutch pedal
Lack of lubrication in clutch linkage
Broken clutch pressure springs
Weak pressure springs

Clutch Dragging—A dragging clutch may be caused by:

Incorrect adjustment of clutch pedal
Incorrect pressure lever adjustment
Loose or broken facings
Bent or dished clutch drive plate due to overheating



1. Clutch Throw-out Lever Link
2. Clutch Pedal
3. Clutch Throw-out Lever Beam
4. Clutch Throw-out Lever Adjusting Link
5. Clutch Throw-out Lever Adjusting Nut
6. Clutch Throw-out Lever
7. Throw-out Lever Pivot
8. Clutch Throw-out Lever Return Spring
9. Release Bearing and Sleeve Assembly
10. Clutch Beam Fulcrum Pin
11. Oiler

FIGURE 16—*Clutch Linkage "Rambler" Series.*

TECHNICAL SERVICE LETTER REFERENCE

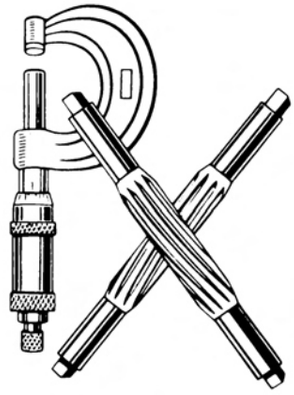
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TECHNICAL SERVICE MANUAL



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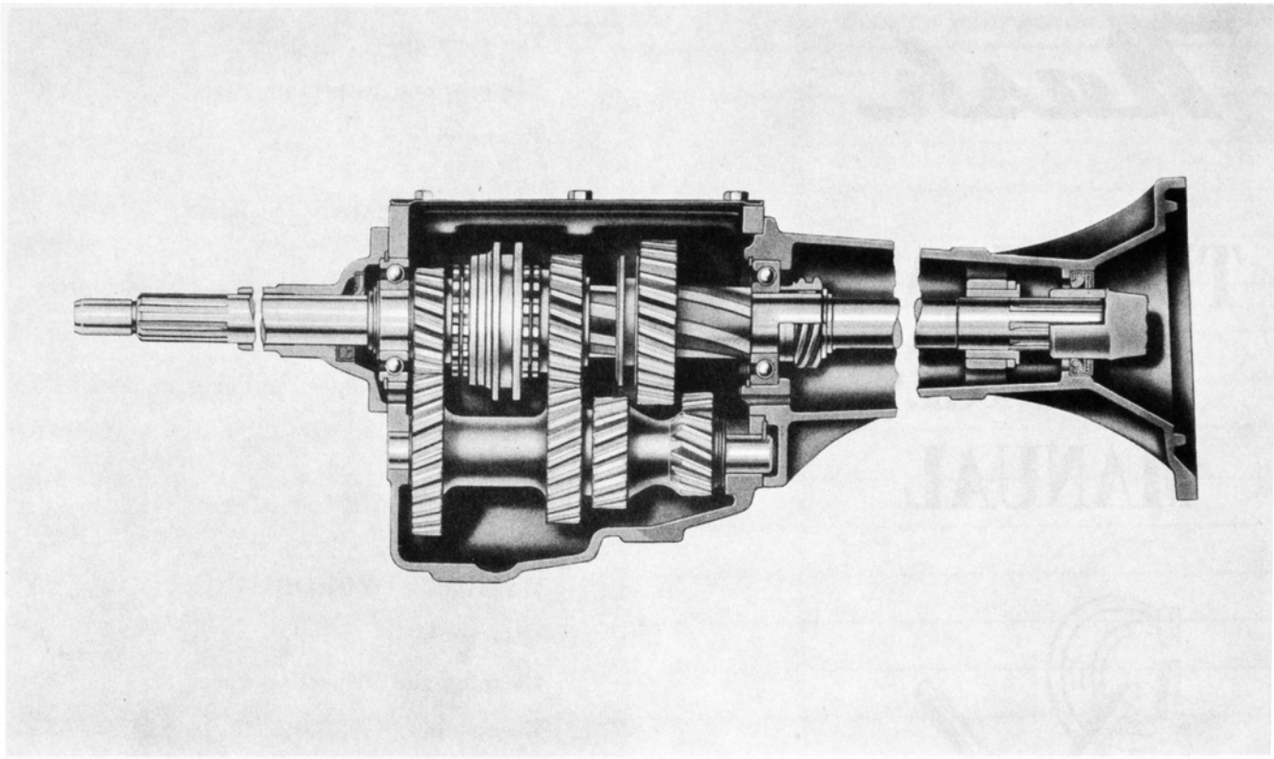
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TRANSMISSION AND OVERDRIVE

TRANSMISSION SECTION

(STANDARD TRANSMISSION ONLY)



1952 "Ambassador" Standard Transmission and Rear Bearing Cap Extension.

1952 "AMBASSADOR"

The transmissions are supplied with or without the overdrive unit (as optional equipment).

The major design difference affecting overhaul procedure on the "Ambassador" and "Statesman" Series is that the standard transmission (without overdrive) is furnished with a longer main shaft and rear bearing cap to permit the use of one propeller shaft and torque tube.

The "Ambassador" and "Statesman" Series are equipped with torque tube drive. The "Rambler" Series is equipped with Hotchkiss drive.

"AMBASSADOR" SERIES TRANSMISSION REMOVAL

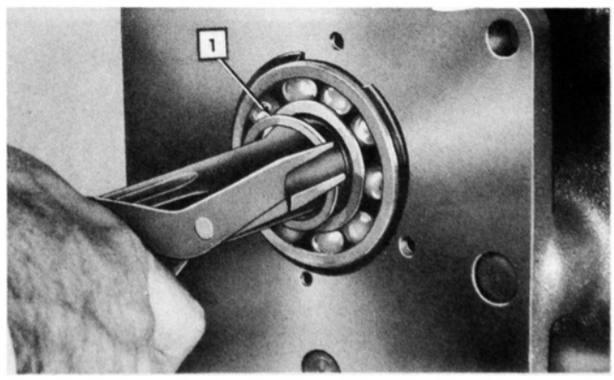
To remove the transmission, disconnect the brake tube bracket that is fastened to the underside of the body; then disconnect the torque tube at the rear of the transmission.

Disconnect the hand brake cable at the bell crank and the brake cable housing at the bell crank bracket. Then move the rear axle to the rear to remove the front universal joint from the transmission main shaft. Disconnect the speedometer cable and shifter rods, and if overdrive equipped, disconnect the wires at the solenoid and the overdrive cable at the lever.

When removing the transmission from the car, care must be taken not to damage the transmission clutch shaft. Always use two guide-pins (Tool J-1434) in place of the two upper cap screws so the transmission clutch shaft will slide out far enough to clear the clutch pilot bearing and clutch disc.

Disassembling the Transmission

With the transmission assembly completely drained of its lubricant and set up in a transmission stand, remove the case cover noting the stamping marked "FRONT" on both the cover and the gasket.



1. Snap Ring

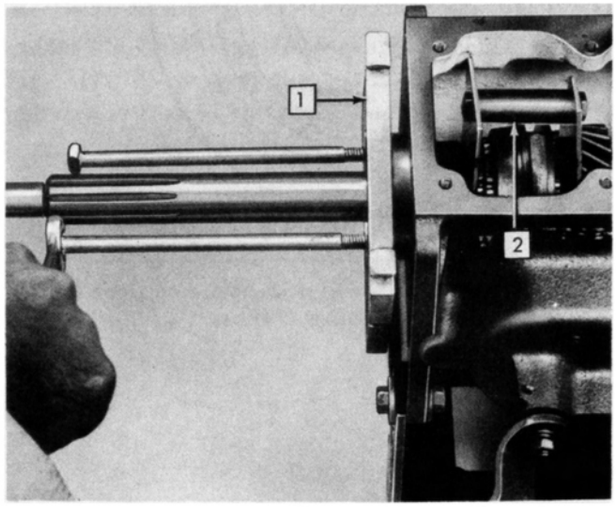
FIGURE 1—*Use Snap Ring Pliers to Remove the Snap Ring.*

TRANSMISSION SECTION
("Ambassador")

Removing the Clutch Shaft Assembly

After removing the front bearing cap, remove the clutch shaft snap ring and the bearing lock ring (Fig. 1).

The front bearing can be removed from the clutch shaft by using bearing puller (J-1298N), together with a thrust yoke (J-3042) to prevent damage to the synchronizer clutch (Fig. 2).



1. Bearing Puller (J-1298N)
2. Thrust Yoke (J-3042)

FIGURE 2—*Use Bearing Puller (J-1298N) Together With Thrust Yoke (J-3042) to Pull the Front Bearing and Prevent Damage to the Synchro-Clutch.*

The oil slinger, being a free fit on the clutch shaft, can then be removed.

By lowering the front end of the clutch shaft and raising the rear end over the countershaft gear, the shaft can be removed from the case. Be careful not to nick the gear teeth as it is being removed (Fig. 3).

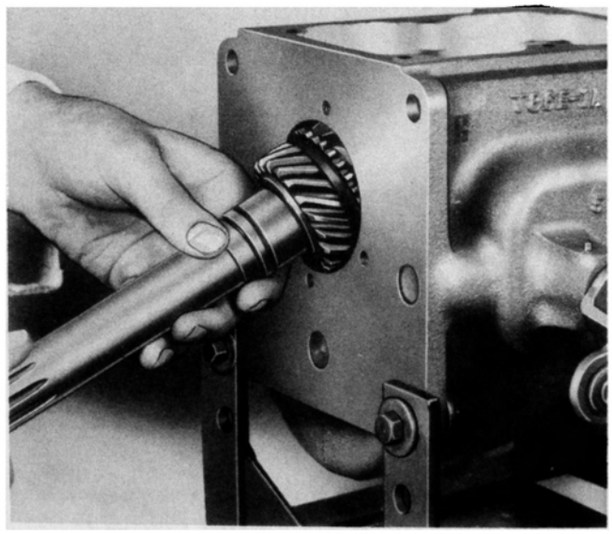
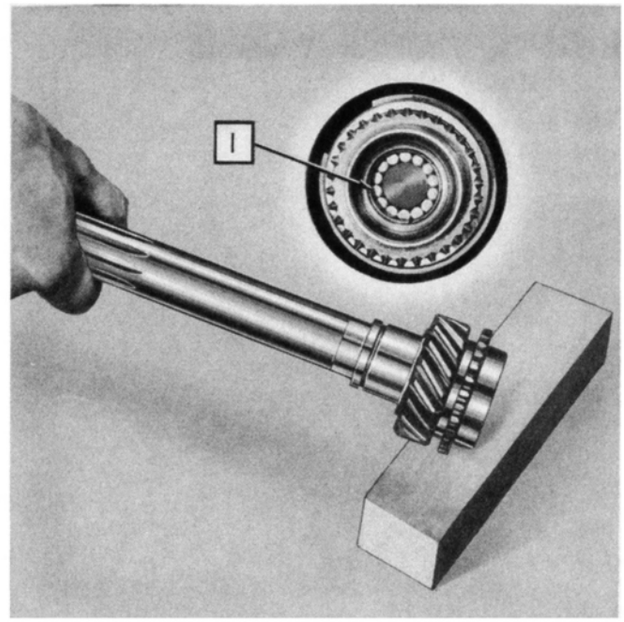


FIGURE 3—*Remove the Clutch Shaft.*

Clutch Shaft Roller Bearings

Inside the rear end of the clutch shaft are fourteen roller bearings. These form the front bearing assembly for the main shaft. Worn or loose rollers will result in a noisy transmission. Inspect for worn, pitted, or scored surfaces (Fig. 4).



1. Roller Bearings

FIGURE 4—*Bearing Rollers Inside the Clutch Shaft Hold Themselves in Place by a "Keystone" Effect. Jarring the Shaft Will Show if These Rollers are Loose.*

REMOVING THE MAIN SHAFT AND BEARING CAP ASSEMBLY

Remove the four cap screws that retain the rear bearing cap to the transmission case. Tap the front

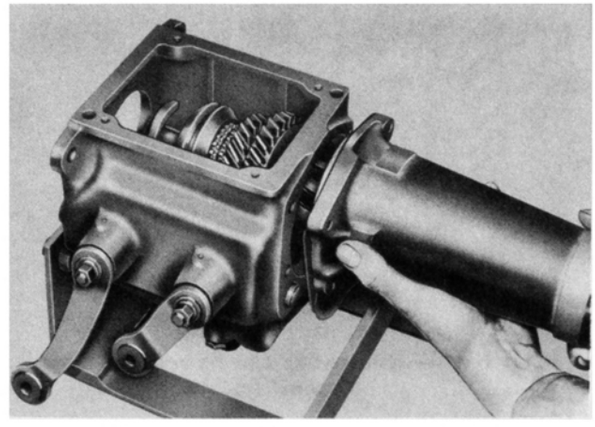


FIGURE 5—*Move the Main Shaft and Bearing Cap Assembly to the Rear About ¾" and to the Right of the Case. The Shifter Forks will Clear the Synchro-Clutch and the Low and Reverse Gears.*

end of the main shaft with a plastic or lead hammer to force the rear bearing cap out of the rear of the transmission case. Now move the main shaft assembly to the extreme right of the case. The synchro-clutch collar and low and reverse gears will clear the shifter forks; then lift out the complete assembly (Fig. 5).

Removing The Gears From the Main (Spline) Shaft

The gears are held on the main shaft by a snap ring (Fig. 6).

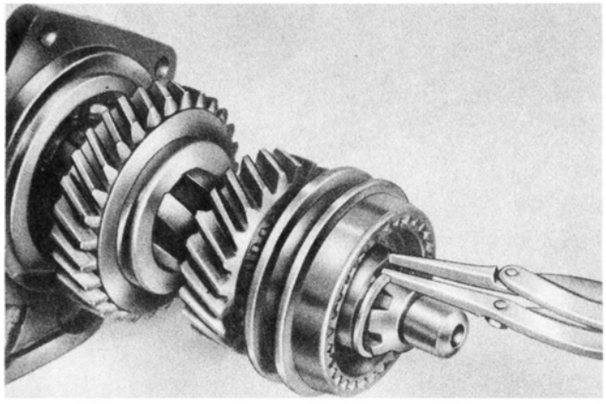


FIGURE 6—*Removing the Main Shaft Snap Ring.*

The Synchro-Clutch Assembly

Remove the synchro-clutch assembly and bronze friction rings (Fig. 7).

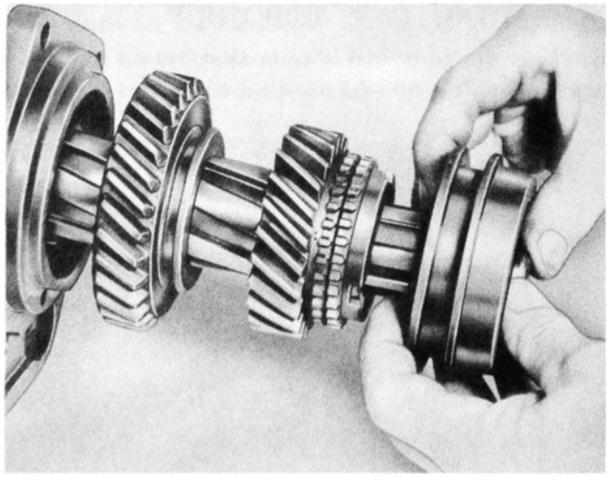


FIGURE 7—*Removing the Synchro-Clutch Assembly.*

The hub section and the outer ring of the synchronizer clutch assembly are matched and lapped when fabricated by the manufacturer and are marked accordingly. The etching marks will correspond when properly assembled (Fig. 8) insuring

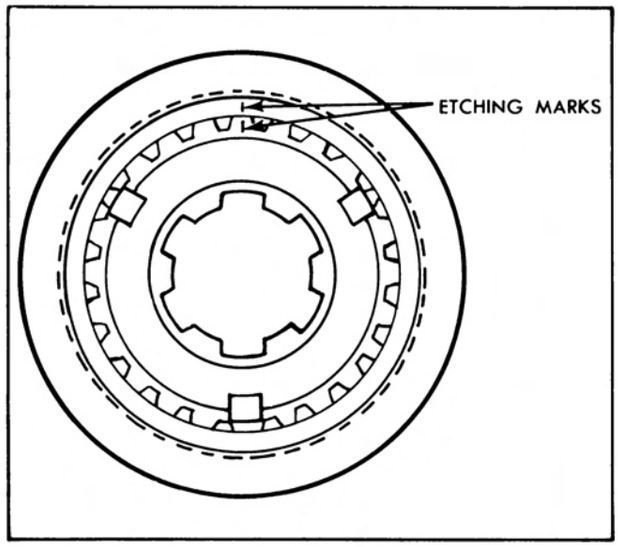


FIGURE 8—*Transmission Synchronizer Unit Etching Marks.*

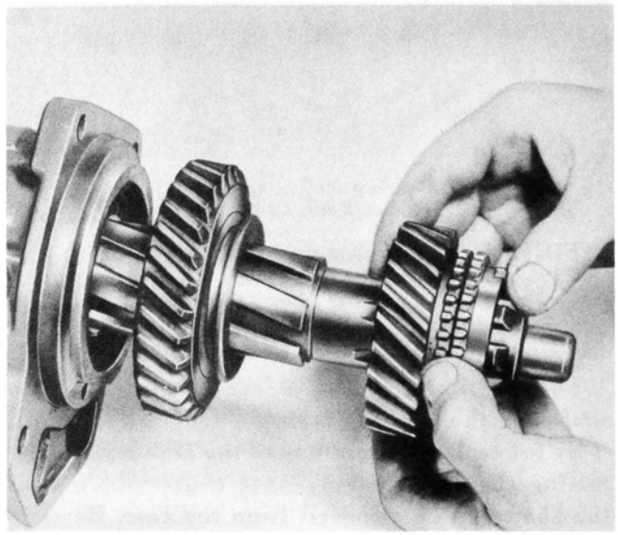


FIGURE 9—*Removing the Second Speed Gear.*

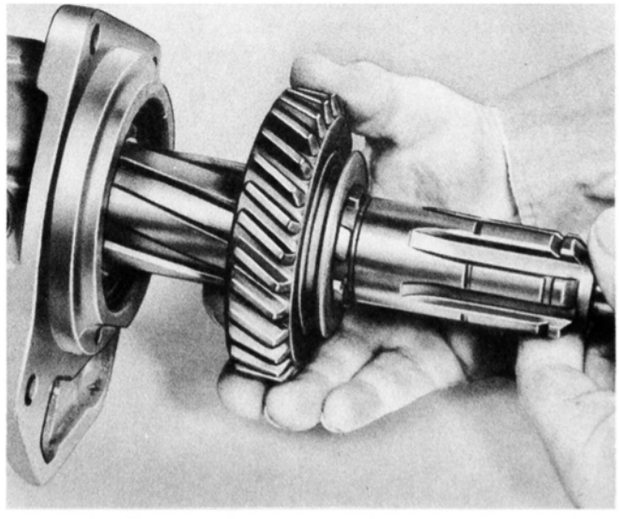


FIGURE 10—*Removing the Low and Reverse Gear.*

smooth sliding action during shifting into second and third speed.

The Second, Low, and Reverse Sliding Gears

The second speed low and reverse sliding gears can now be removed by sliding them off the front end of the main shaft (Figs. 9 and 10).

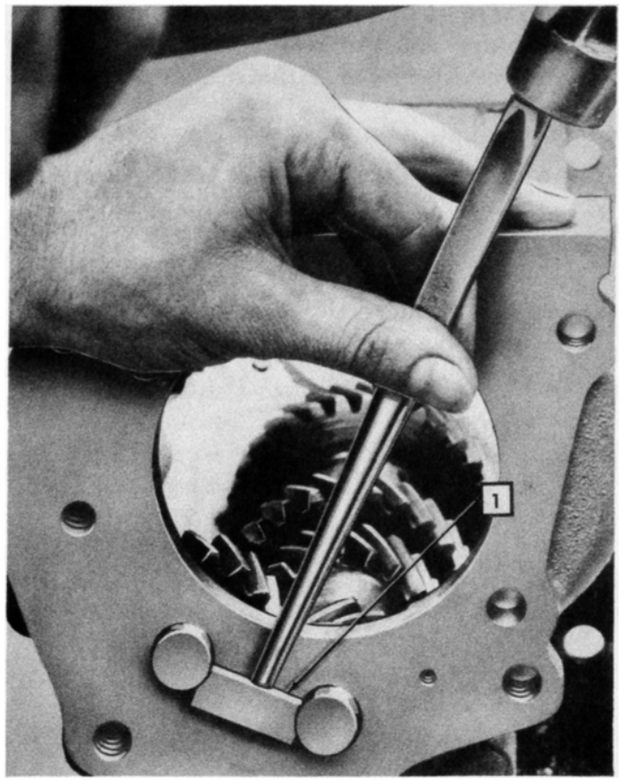
The Rear Bearing and Bearing Cap

Remove the snap ring from the rear bearing cap (Fig. 11). To remove the main shaft and bearing, tap the rear of the main shaft using a plastic or lead hammer. The rear bearing and speedometer gear will remain on the shaft.

Remove the main shaft snap ring and the speedometer drive gear. (The speedometer drive

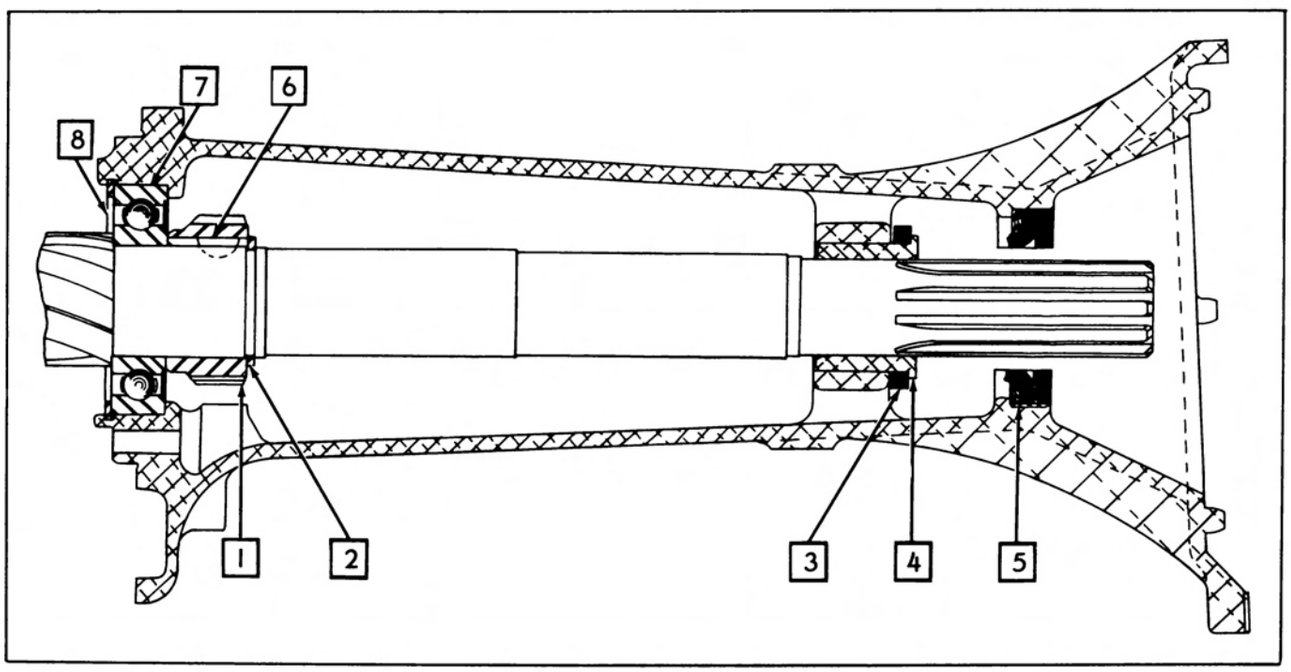


FIGURE 11—*Remove the Snap Ring From the Front of the Rear Bearing Cap.*



1. Lock Plate

FIGURE 13—*Remove the Lock Plate.*



1. Speedometer Drive Gear
2. Speedometer Drive Gear Snap Ring
3. Oilite Bushing Felt
4. Oilite Bushing
5. Rear Main Bearing Cap Oil Seal
6. Speedometer Drive Gear Key
7. Ball Bearing
8. Ball Bearing Lock Ring

FIGURE 12—*Sectional View of Rear Bearing Cap.*

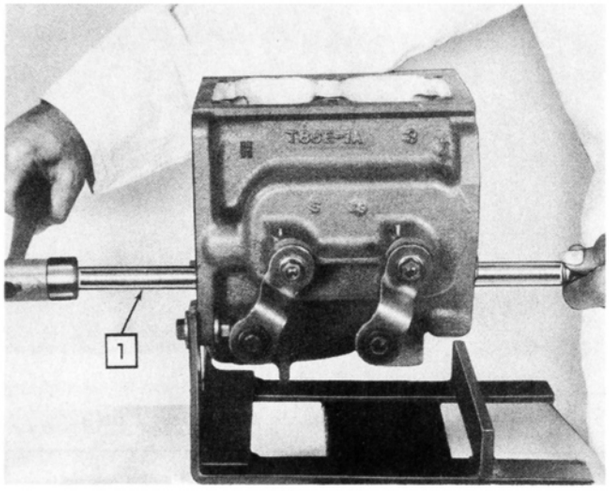
gear is held in position with a Woodruff key.) Then press off the rear bearing after the key is removed.

The transmission main shaft bushing (4) and felt ring (3) (which acts as a lubricant wick for the bushing) and the rear bearing cap oil seal (5) can be driven out to the rear of the bearing cap (Fig. 12).

Removing the Countershaft Gear Assembly

Remove the reverse idler and countershaft lock plate (Fig. 13).

To maintain the position of the needle bearings in the countershaft gear, drive the countershaft out of the rear of the case using a dummy shaft machined to .750″ x 7 1/16″ (Fig. 14).



1 Dummy Shaft .750″x7 1/16″

FIGURE 14—*Use a Dummy Shaft Machined to .750″ x 7-1/16″ to Remove the Countershaft.*

With the dummy shaft in place, lower the countershaft gear to the bottom of the case.

Remove the reverse idler gear shaft by using a brass drift (Fig. 15), and lift the reverse idler gear out of the case.

Lift the countershaft gear assembly out of the transmission case (Fig. 16).

REMOVING THE INTERLOCK ASSEMBLY

Remove the outer shift levers and shifter shaft lock pins (Fig. 17).

Remove the shifter shafts from the inside of the case slowly to catch the two interlock ball bearings as the shafts are being removed. The interlock sleeve and spring can then be removed.

Now remove the shifter shaft oil seals from the case. This completes the disassembly of the transmission.

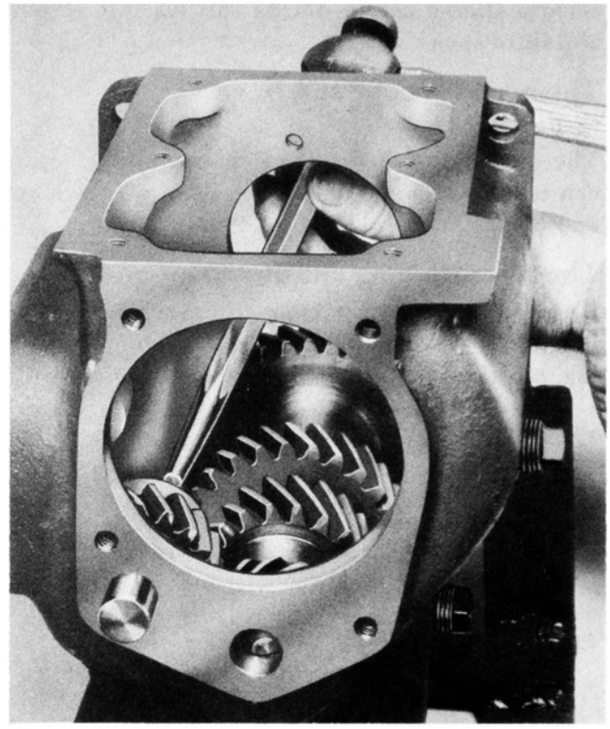


FIGURE 15—*Removing the Reverse Idler Gear Shaft.*

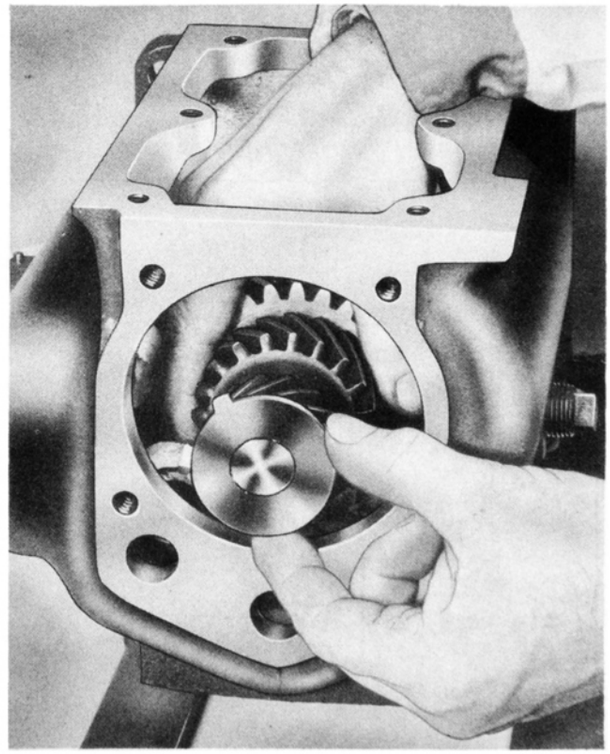
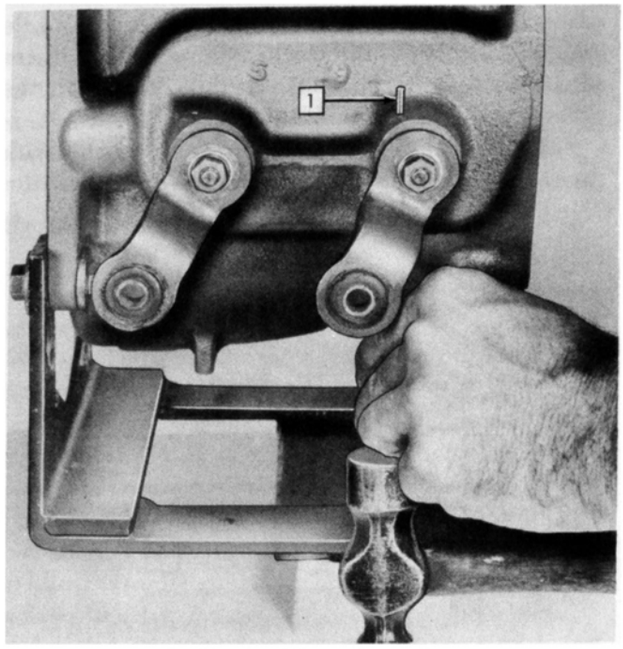


FIGURE 16—*Removing the Countershaft Gear Assembly.*

CLEANING AND INSPECTING PARTS

With the transmission completely disassembled, all parts should be carefully cleaned so that they can be thoroughly examined.

TRANSMISSION SECTION
("Ambassador")



1. Shifter Shaft Lock Pin

FIGURE 17—*Drive Out the Shifter Shaft Lock Pins From the Bottom of the Bosses.*

Gears

Wash all gears in a cleaning solution. Inspect for worn, cracked, or chipped teeth. Slide each gear onto a new shaft. If it appears to be loose, it must be replaced.

NOTE: *Whenever any transmission gear requires replacement, the gear with which it meshes should also be replaced.*

Bearings

Bearings must be handled with great care. Wrap them in a clean cloth or paper until they can be washed.

To wash a bearing, submerge it in a cleaning solution that is absolutely free of dirt, and rotate it to flush away all oil and dirt. Dry the bearing with care.

Carefully examine each bearing for cracked races, worn, or scored balls.

Main Shaft

Install the gears onto the main shaft to be sure they slide on and off easily. They should fit smoothly

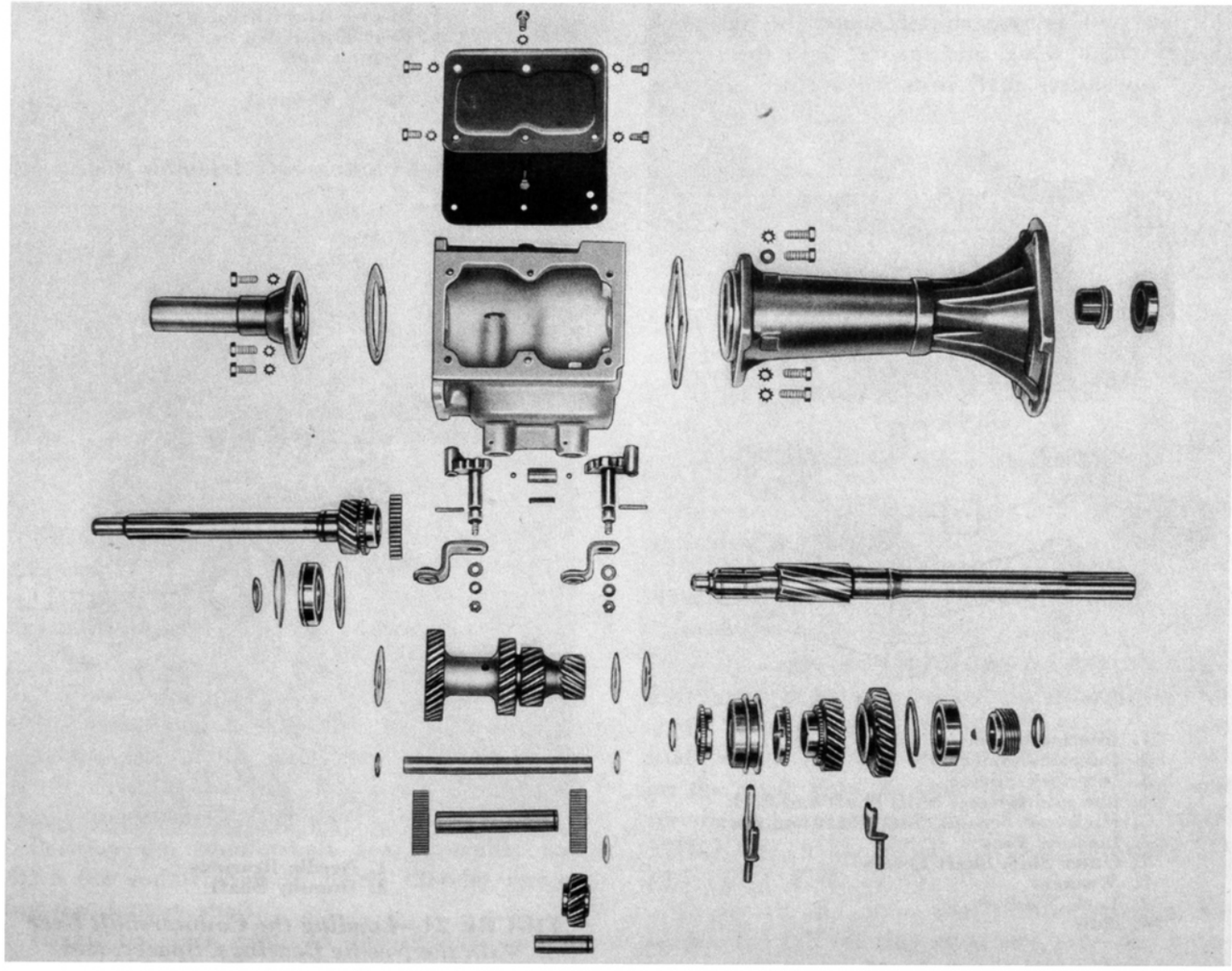


FIGURE 18—"*Ambassador*" *Series Standard Transmission.*

without excessive play between the splines. If the fit is tight, look for burred edges on the splines.

Synchro-Clutch and Friction Rings

Carefully inspect the synchro-clutch and friction rings. Slide the rings on the cones of the second speed gear and the clutch shaft. Replace rings if there is excessive wear on the taper.

Transmission Case

Examine the surfaces of the bearing recesses in the transmission case for wear or scoring, which indicates that the bearing has been revolving in its housing. Examine the case for cracks or other defects.

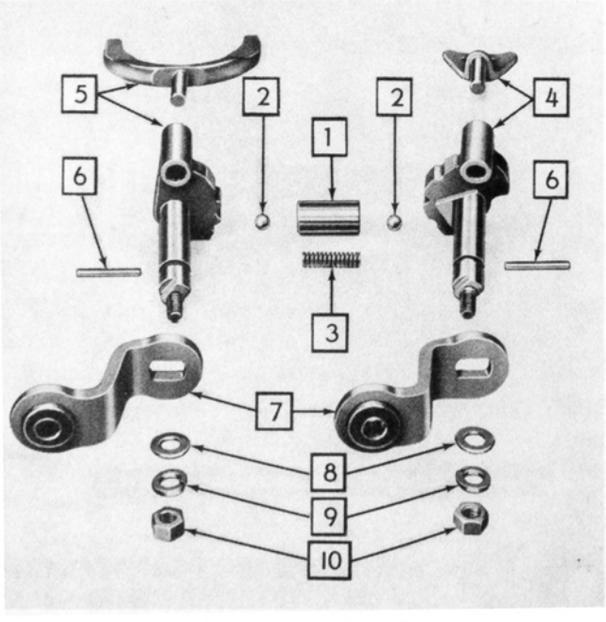
Be certain that all parts of the case are thoroughly clean before and during assembly.

REASSEMBLY

When reassembling the transmission, always use new gaskets and oil seals.

Shifter Shafts and Levers

Install new shifter shaft oil seals. Then reinstall the low and reverse shifter shaft, the interlock sleeve, ball bearing, and spring. With the second and high shifter shaft installed against the case,

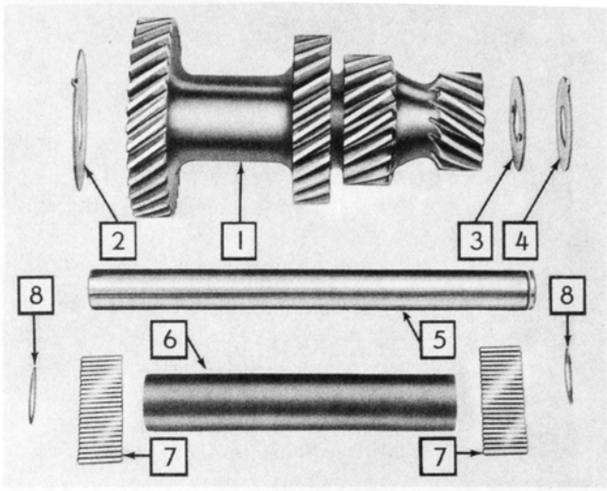


1. Interlock Sleeve
2. Interlock Balls
3. Interlock Spring
4. Low and Reverse Shift Shaft and Fork
5. High and Second Shift Shaft and Fork
6. Locking Pins
7. Outer Shift Shaft Levers
8. Washers
9. Lock Washers
10. Nuts

FIGURE 19—*Assembly Sequence of the Shifter Mechanism.*

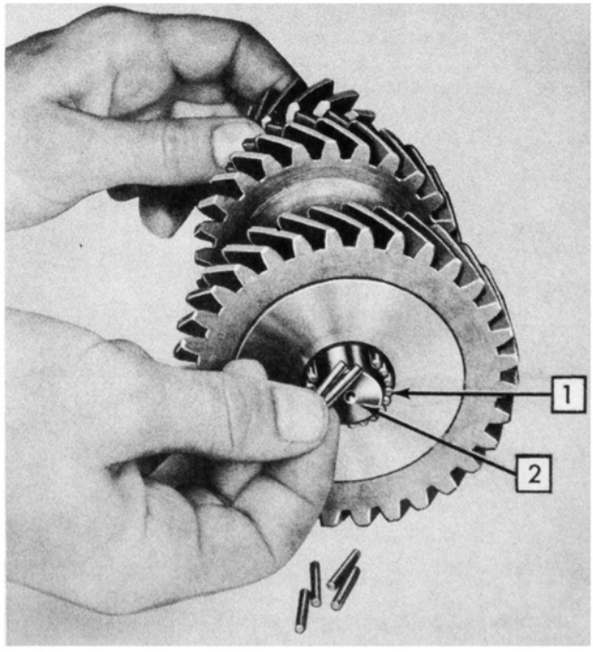
place the second ball bearing in position. While compressing the interlock spring with finger pressure, locate the ball in the detent of the quadrant.

Shift the transmission into any one gear and, with one end of the interlock sleeve against the shifter



1. Countershaft Gear
2. Front Thrust Washer
3. Bronze Rear Thrust Washer
4. Rear Thrust Washer
5. Countershaft
6. Spacer
7. Needle Bearings
8. Bearing Rings

FIGURE 20—*Countershaft Assembly Sequence.*



1. Needle Bearings
2. Dummy Shaft

FIGURE 21—*Loading the Countershaft Gear With the Needle Bearings, Spacer, and Washers (Bearing Rings) by Using a Dummy Shaft.*

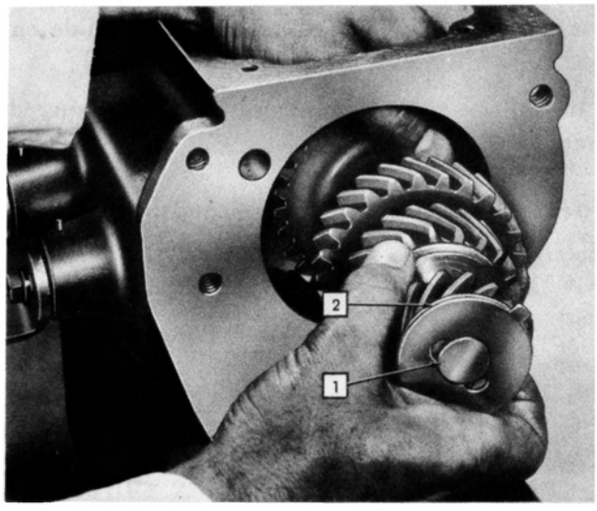
shaft quadrant, the clearance between the opposite end of the sleeve and the quadrant on the other shaft should be from .001" to .007". After installing the correct size sleeve, lock the shifter shafts in place with lock pins and install the shift levers.

Reinstalling the Countershaft Gear and Shaft

To hold the countershaft needle bearings, spacer, and washers in place while installing the countershaft gear, load the countershaft gear by using the dummy shaft (Fig. 21).

After installing the bearings in the countershaft gear, and holding it in such a manner so as not to drop the dummy shaft, install the thrust washers. The two small projections on the face of the bronze *rear* thrust washer must index with the grooves in the countershaft gear. The *front* bronze thrust washer must index with the transmission case.

Position the large rear thrust washer and insert the assembly in the bottom of the case (Fig. 22).



1. Dummy Shaft
2. Rear Thrust Washer

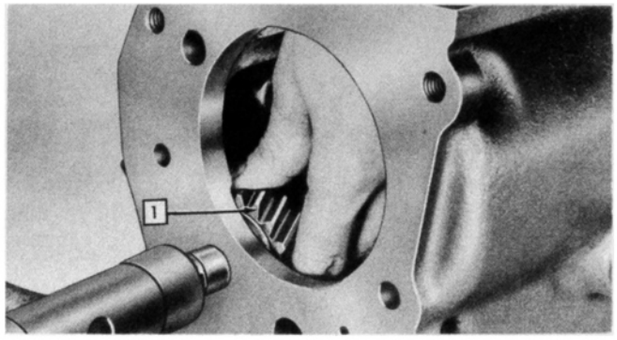
FIGURE 22—*Install the Countershaft Gear Assembly in the Transmission Case.*

Reinstalling the Reverse Idler Gear

Install the reverse idler gear with the chamfered side of the teeth (or the hub section) to the front of the case. Then drive the reverse idler shaft in from the rear of the case with the notched end of the shaft to the rear. The notch should face to the countershaft (Fig. 23).

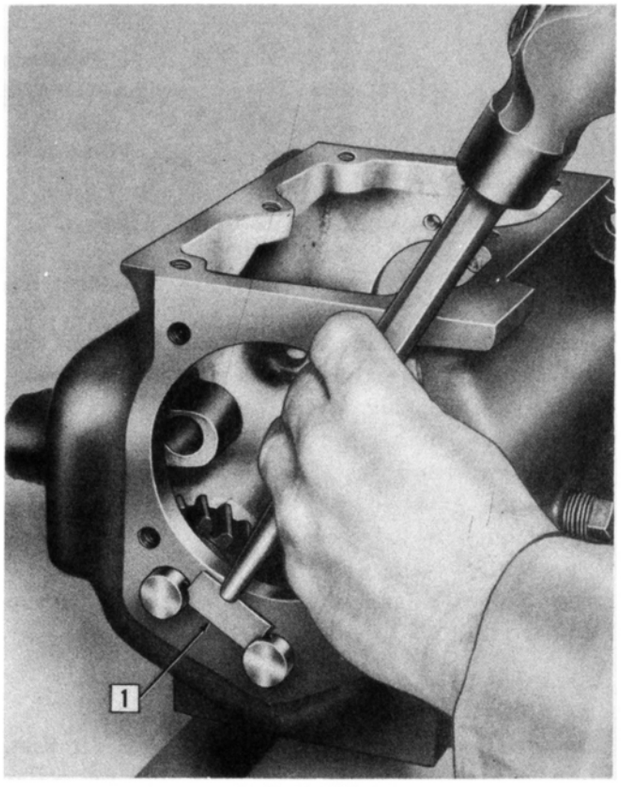
Position the countershaft gear assembly and drive the countershaft in place, thereby removing the dummy shaft.

Install the lock plate in the grooves in the countershaft and reverse idler shaft (Fig. 24).



1. Reverse Idler Gear

FIGURE 23—*Installing Reverse Idler Gear.*



1. Lock Plate

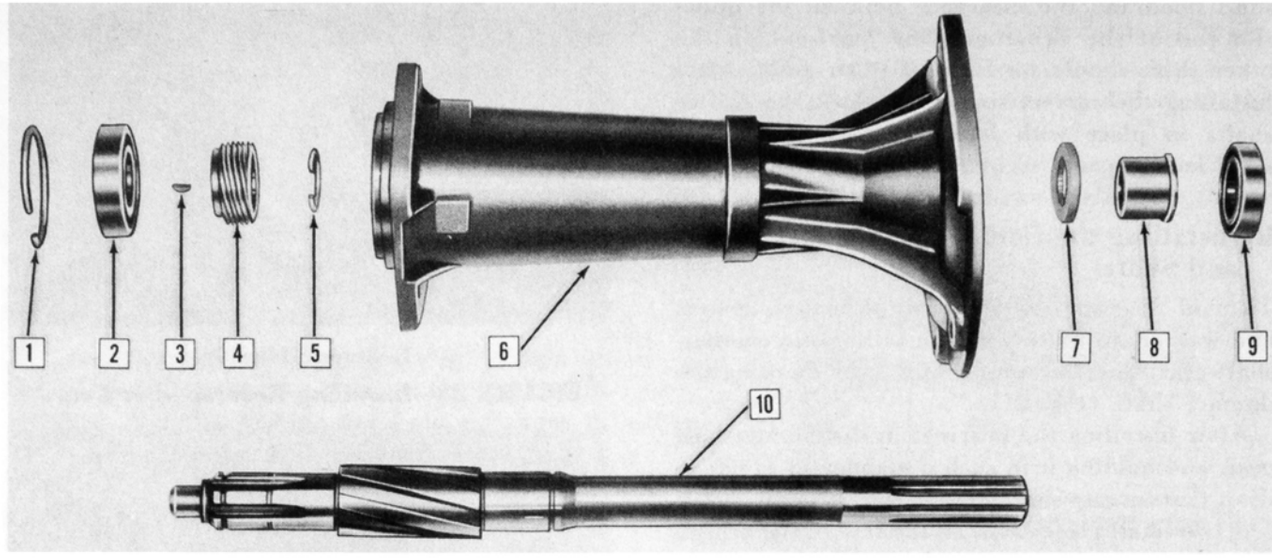
FIGURE 24—*Installing the Lock Plate.*

Now install the low and reverse and, second and high shifter forks.

Assembling the Main (Spline) Shaft and Rear Bearing Cap

Press the rear transmission bearing onto the main shaft until it is tight against the shoulder of the shaft. Then place the Woodruff key in the main shaft keyway, install the speedometer drive gear on the shaft tight against the rear bearing, and install the snap ring (Item 5, Fig. 25). USE THE THICKEST SIZE SNAP RING POSSIBLE TO PREVENT END PLAY.

To install the main shaft Oilite bushing, assemble the felt oil ring on it and press the bushing into the rear bearing cap. The shoulder on



1. Rear Ball Bearing Lock Ring
2. Rear Ball Bearing
3. Woodruff Key
4. Speedometer Drive Gear
5. (Main Shaft) Snap Ring
6. Rear Bearing Cap
7. Oilite Bushing Felt
8. Oilite Bushing
9. Rear Bearing Cap Oil Seal
10. Transmission Main (Spline) Shaft

FIGURE 25—*Rear Bearing Cap and Main Shaft.*

the main shaft bushing must remain ¼" from the shoulder in the bearing cap to prevent compressing the felt oil ring (Item 7, Fig. 25).

Install the main shaft assembly into the rear bearing cap, and install the rear bearing lock ring (Item 1, Fig. 25). This lock ring must be large enough to fill the groove in the main shaft to prevent possible end play.

Use Tool J-1556 to install the rear bearing cap oil seal (Item 9, Fig. 25).

Assembling the Gears on the Main (Spline) Shaft

The low and reverse sliding gear goes on first. Slide it onto the shaft with the shifting collar to the front. The gear should be free to slide on the splines for easy shifting (Fig. 26).

Install the second speed gear with the tapered cone to the front.

The Synchronizer Clutch Assembly

Install the synchro-clutch assembly, being sure that the hub section and the outer ring are correctly assembled as shown in Figure 8.

(The front friction ring is installed together with the clutch shaft to prevent its dropping out of place during installation of the main shaft assembly.)

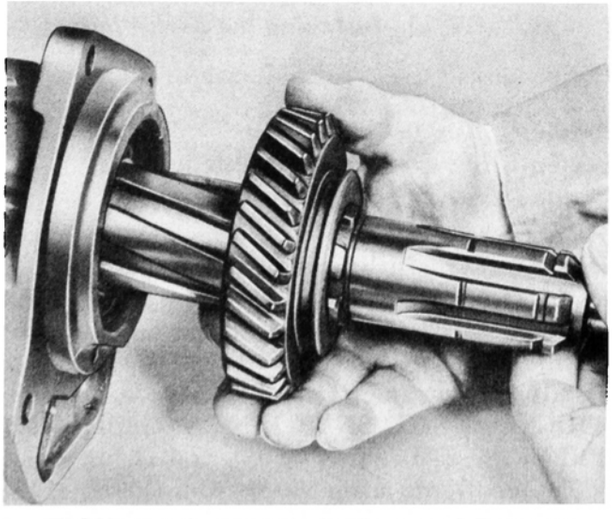
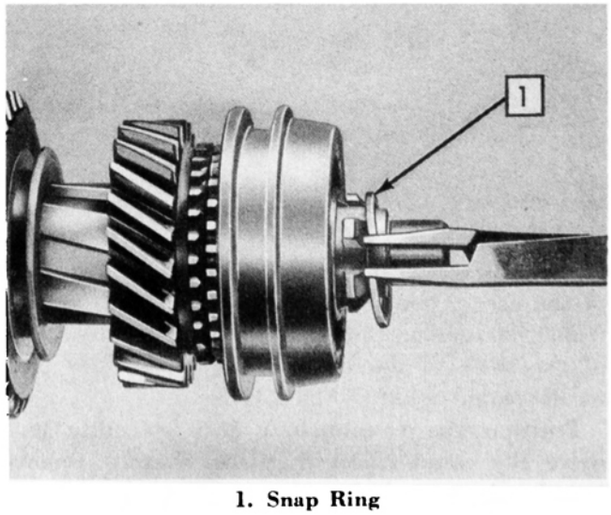


FIGURE 26—*Install the Low and Reverse Sliding Gear.*



1. Snap Ring

FIGURE 27—*Complete the Main Shaft Assembly by Installing the Front Snap Ring.*

TRANSMISSION SECTION
("Ambassador")

Completing the Main Shaft Assembly

Install the main shaft front snap ring using snap ring pliers (Fig. 27).

When the synchro-clutch hub is pressed tight against the snap ring, there should be .003″ to .010″ clearance between the second speed gear and the shoulder on the main shaft.

Installing the Transmission Main Shaft Assembly

Install the main shaft assembly through the rear of the case. As this is done, move it to the right side of the case so as to engage the shifter forks.

Installing the Clutch Shaft Assembly

Insert the fourteen clutch shaft bearings in the clutch shaft. A coat of lubriplate will hold them in position. Then install the front friction ring and the clutch shaft on the main shaft (Fig. 28).

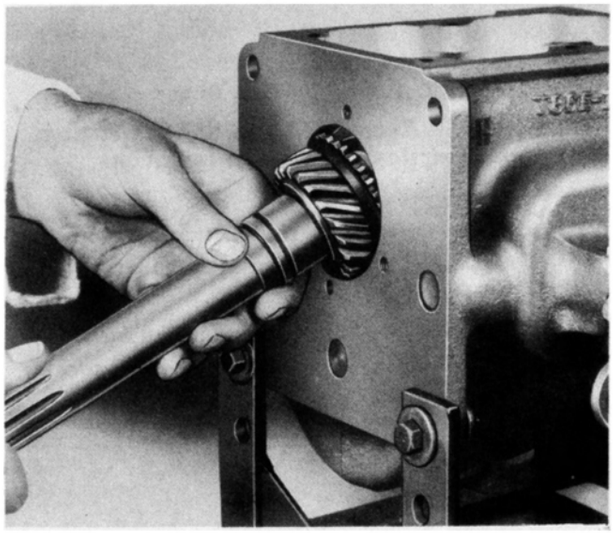


FIGURE 28—*Installing the Clutch Shaft.*

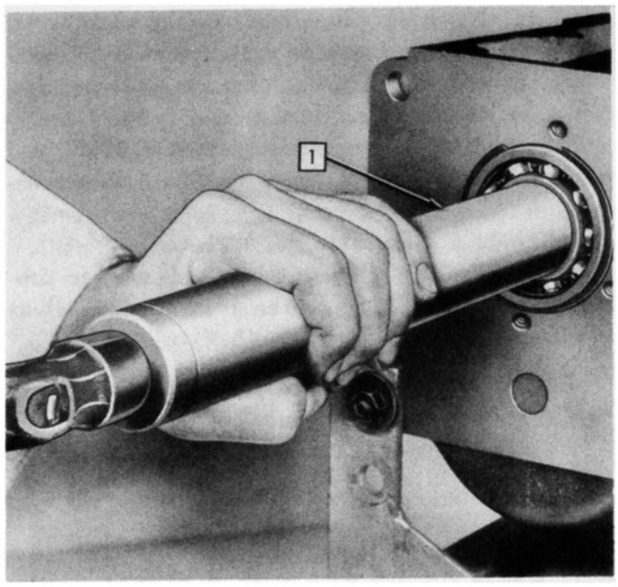
Install the oil slinger on the clutch shaft with the concave side to the rear.

The front bearing can be driven in place using Tool J-2995, together with the thrust yoke (J-3042).

The clutch shaft small snap ring can be installed with snap ring pliers or Tool J-2995 Snap Ring Installing Set. Then install the large bearing snap ring (Fig. 29).

After installing a new oil seal in the bearing cap, install the bearing cap. Always use a new gasket between the bearing cap and the case. The thickness of the gasket used governs clutch shaft end play. The desired end play is .000″.

The transmission now requires only a final check by shifting in all gears. Check the operation carefully, then install the case cover and



1. Tool J-2995

FIGURE 29—*Installing the Clutch Shaft Bearing.*

gasket, placing the stamping marked "FRONT" to the front of the case (Fig. 30).

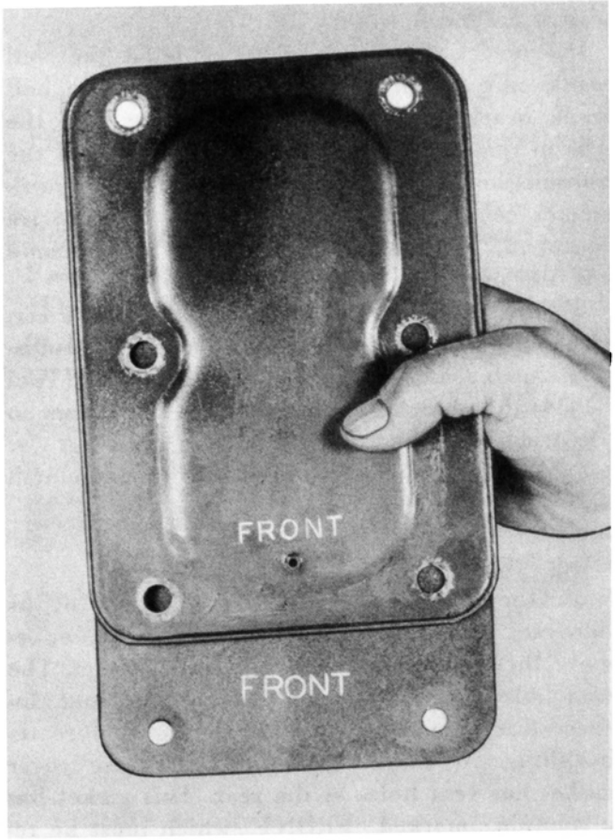


FIGURE 30—*Note the Stamping Marked "FRONT" on Both Cover and Gasket.*

Lubrication of the Transmission

Check the lubricant level of the transmission every 1,000 miles. The transmission should be

filled to the drain plug level on the right side. Drain and clean twice a year, or every 10,000 miles, using only flushing oils. Do not use gasoline, kerosene, steam, etc.

For atmospheric temperatures above 32°F., use mineral gear lubricant SAE No. 90 in the transmission.

Below 32°F., use SAE No. 80.

When difficulty in shifting is experienced in sub-zero temperatures, dilute the transmission oil as required using light engine oil.

CAUTION: *Do not use gear oil with extreme pressure lubricants or other compounded agents.*

Transmission capacity (U.S). 2¼ pints.

1952 "STATESMAN"

"STATESMAN" SERIES TRANSMISSION REMOVAL

To remove the transmission, disconnect the brake tube bracket that is fastened to the underside of the body; then disconnect the torque tube at the rear of the transmission.

Disconnect the hand brake cable at the bell crank and the brake cable housing at the bell crank bracket. Then move the rear axle to the rear to remove the front universal joint from the transmission main shaft. Disconnect the speedometer cable and shifter rods, and if overdrive equipped, disconnect the wires at the solenoid and the overdrive cable at the lever.

When removing the transmission from the car, care must be taken not to damage the transmission clutch shaft. Always use two guide-pins (Tool J-1434) in place of the two upper cap screws so the transmission clutch shaft will slide out far enough to clear the clutch pilot bearing and clutch disc.

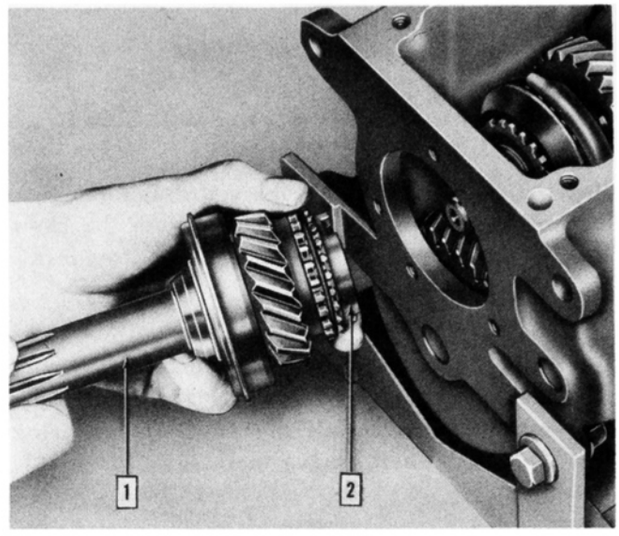
Disassembling the Transmission

With the transmission assembly drained of its lubricant and set up in a transmission stand, remove the transmission case cover and gasket. The vent hole in the cover should be at the front. Inspect this hole to see that it is clear before reinstalling on the transmission. The case cover gasket has vent holes at the rear. This gasket has a stamping marked "FRONT" which must be replaced to the front when it is installed.

Removing the Clutch Shaft Assembly

Remove the cap screws that hold the front bearing cap to the transmission case and remove the bearing cap. (Note that the bottom of the cap is recessed to allow any lubricant that passes the bearing to drain back into the transmission case.)

Remove the clutch shaft and bearing from the front of the case. At the same time, remove the front friction ring (Fig. 31).



1. Clutch Shaft
2. Bronze Friction Ring

FIGURE 31—*Remove Clutch Shaft, Bearing, and Friction Ring From the Front of the Case.*

Remove the snap ring that retains the bearing on the clutch shaft, and press the bearing from the shaft (Fig. 32).

NOTE: *The large lock ring on the outside of the bearing need not be removed unless the bearing is to be replaced. Only one ring thickness (.077") is used.*

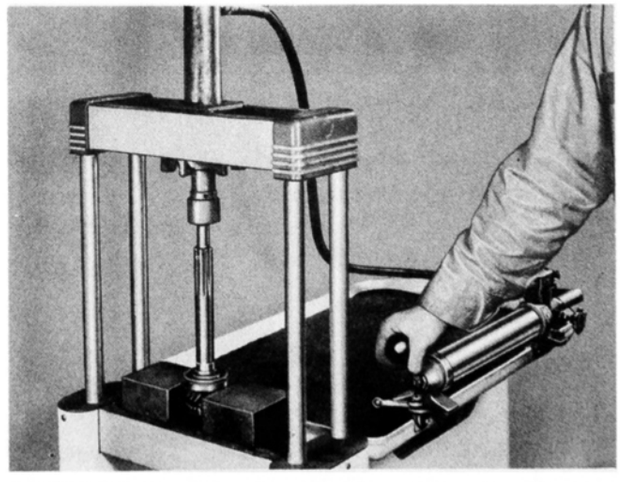
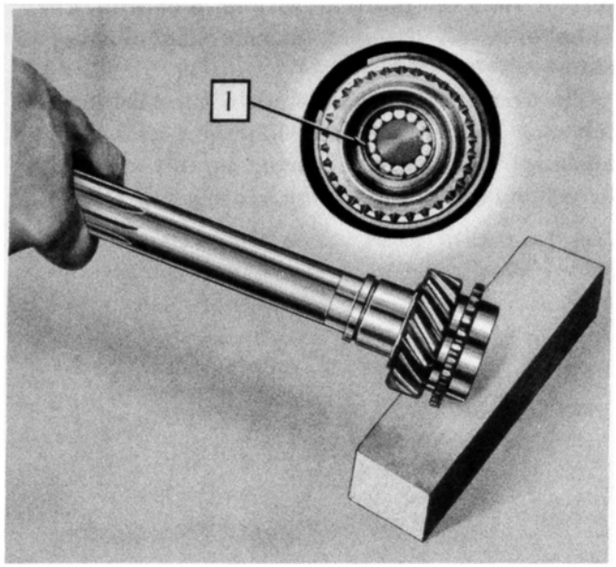


FIGURE 32—*Pressing the Front Bearing From the Clutch Shaft.*

Clutch Shaft Bearing Rollers

Inside the rear end of the clutch shaft are thirteen roller bearings. These form the front bearing for the main shaft.

Worn or loose rollers in this bearing will result in a noisy transmission. Inspect for pitted or scored rollers. Jar the end of the clutch shaft against a block of wood (Fig. 33). If the rollers fall out, they are loose and should be replaced.



1. Roller Bearings

FIGURE 33—*Bearing Rollers Inside the Clutch Shaft Hold Themselves in Place by a "Keystone" Effect.*

Removing the Main Shaft Assembly

The shifting mechanism is not removed until the main shaft assembly has been taken out. However, if desired, the reverse shifter shaft can be driven to the outside of the case to provide clearance for removing the low and reverse gear. This is done by removing the lock pin from the outside boss and driving the shifter shaft to the outside of the case.

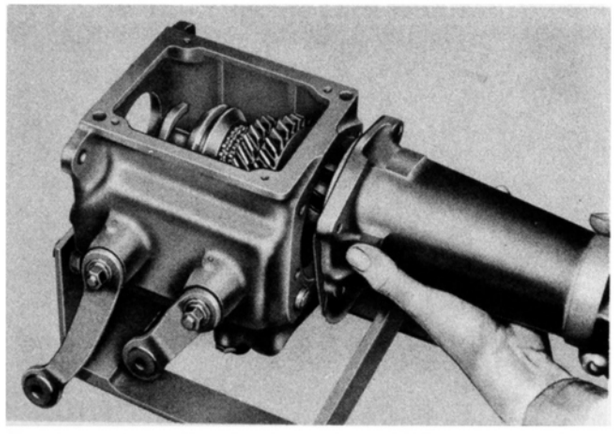


FIGURE 34—*Move the Main Shaft and Bearing Cap Assembly to the Rear About 3/4" and to the Right of the Case. The Second and High Shifter Fork Will Clear the Synchro-Clutch.*

Then remove the rear oil seal. Remove the cap screws that hold the rear main bearing cap to the transmission case. Move the complete main shaft and bearing cap assembly out of the case about 1/2" to 3/4" (Fig. 34).

Now move the main shaft assembly to the extreme right of the case. The second and high shifter fork will clear the synchro-clutch collar. Clearance is provided to shift the low and reverse shifter fork forward clear of the low and reverse sliding gear (Fig. 35).

This will permit the rear main bearing cap, main shaft, and gear assembly to be withdrawn from the transmission case. Then remove both shifter forks.

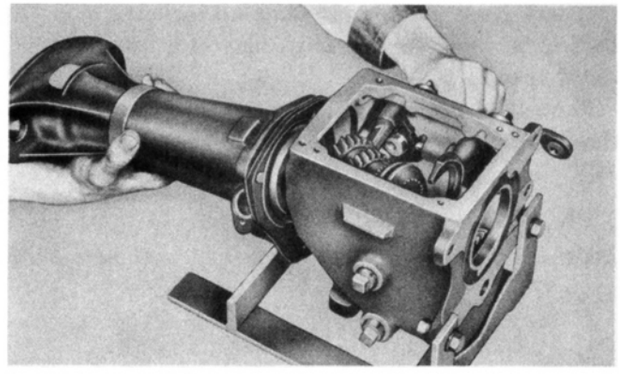


FIGURE 35—*Shift the Low and Reverse Shifter Fork Forward to Clear the Low and Reverse Sliding Gear.*

Removing the Gears From the Main Shaft

Remove the snap ring at the end of the main shaft (Fig. 36). The snap ring holds the gear assembly to the main shaft and also governs the second speed gear end play.

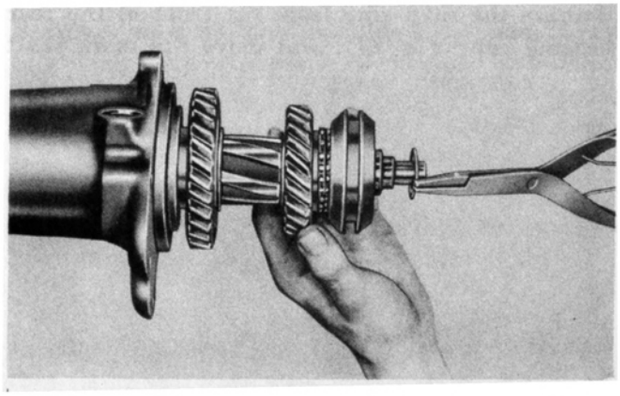


FIGURE 36—*Remove the Snap Ring on the End of the Main Shaft.*

Remove the synchro-clutch assembly, the friction ring, and second speed gear (Fig. 37).

The hub section and the outer ring of the synchronizer clutch assembly are matched and lapped when fabricated by the manufacturer and are

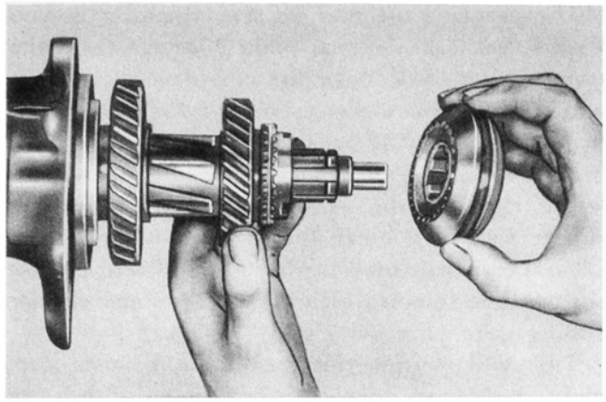


FIGURE 37—*Remove the Synchro-Clutch Friction Ring and Second Speed Gear.*

marked accordingly. The etching marks will correspond when properly assembled insuring smooth sliding action during shifting into second and third speed.

Now slide the first and reverse sliding gear from the main shaft (Fig. 38).

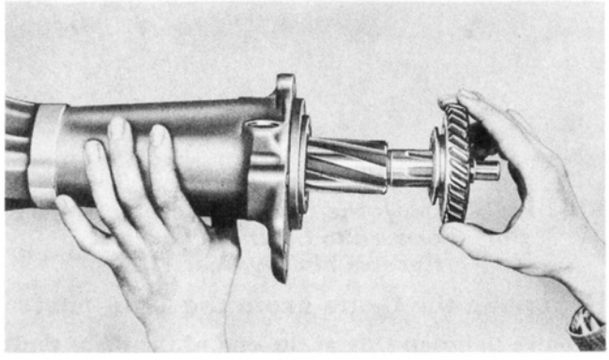


FIGURE 38—*Remove the First and Reverse Sliding Gear.*

The Rear Bearing and Bearing Cap

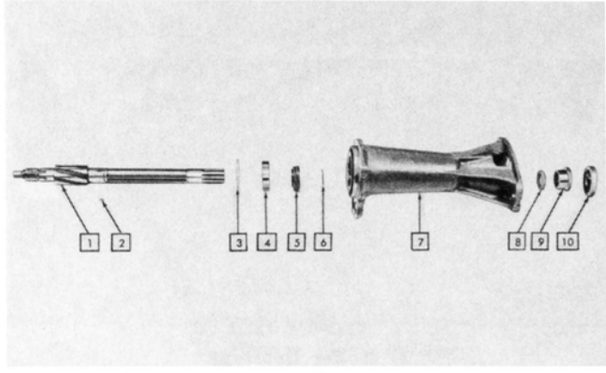
Remove the snap ring from the front of the rear bearing cap (Fig. 39), and drive the main shaft toward the front with a brass drift. The rear bearing and the speedometer gear will remain on the shaft.



FIGURE 39—*Remove the Snap Ring From the Front of the Rear Bearing Cap.*

Remove the main shaft snap ring and the speedometer drive gear. (The speedometer drive gear is held in position with a Woodruff key.) Then press off the rear bearing after the key is removed.

The transmission main shaft Oilite bushing and felt ring (which acts as a lubricant wick for the bushing) and the rear bearing cap oil seal can be driven out to the rear of the bearing cap (Fig. 40).

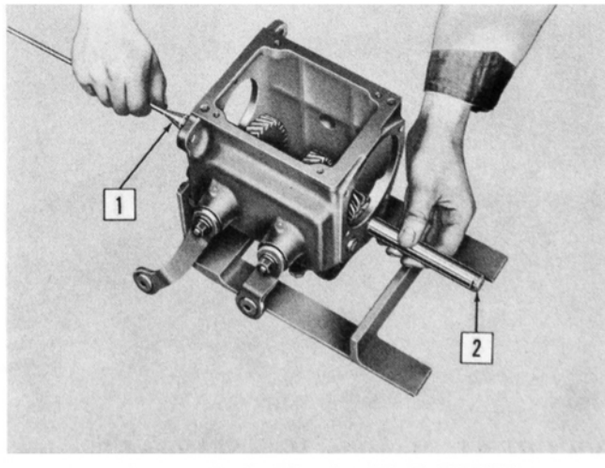


1. Transmission Main (Spline) Shaft
2. Woodruff Key
3. Rear Ball Bearing Lock Ring
4. Transmission Rear Bearing
5. Speedometer Drive Gear
6. Transmission Main Shaft Snap Ring
7. Rear Bearing Cap
8. Oilite Bushing Felt
9. Oilite Bushing
10. Rear Bearing Cap Oil Seal

FIGURE 40—*Main Shaft and Rear Bearing Cap Assembly Sequence.*

The Countershaft and Gear

To remove the countershaft and gear after the rear bearing cap has been removed, drive out the countershaft lock plate with a small punch. Then with



1. Countershaft Aligning Tool (J-2632)
2. Countershaft

FIGURE 41—*Removing Countershaft From Transmission Case.*

countershaft aligning tool (J-2632), tap the countershaft out from the front to the rear (Fig. 41).

Remove the countershaft aligning tool, countershaft gear, and front and rear thrust washers.

Removing the Reverse Idler Gear

Using a long punch, drive the reverse idler gear shaft out through the rear of the transmission case being careful not to damage either the shaft or the case. Then lift out the gear.

Removing the Shifter Shafts and Forks

With the main shaft and reverse idler gear out of the way, the high and low shifter shafts can be easily removed from the transmission case. Remove the shift levers and the shifter lock pins. Now both shifter shafts can be removed through the top of the transmission case (Fig. 42).

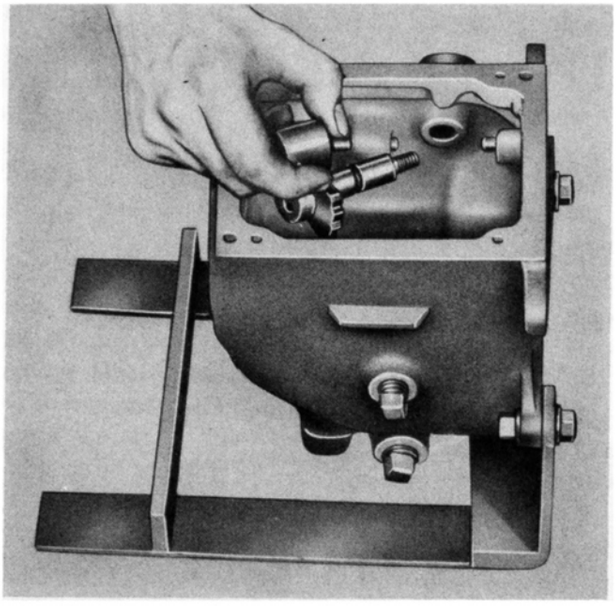


FIGURE 42—*After the Lock Pins Have Been Removed, the Shifter Shafts Can be Removed From the Inside of the Case.*

Remove the two speed finder poppets from the transmission case. The high and second speed gear poppet is in front of the case. Removing the plug at the bottom of the case (beneath the low speed shifter shaft quadrant) will allow the low speed finder poppet and spring to be removed (Fig. 43).

Remove the interlock poppet from the boss between the two shifter shafts.

NOTE: *If the shifter shaft seals show signs of leaking, remove them by prying them out of the case.*

This completes the disassembly of the transmission.

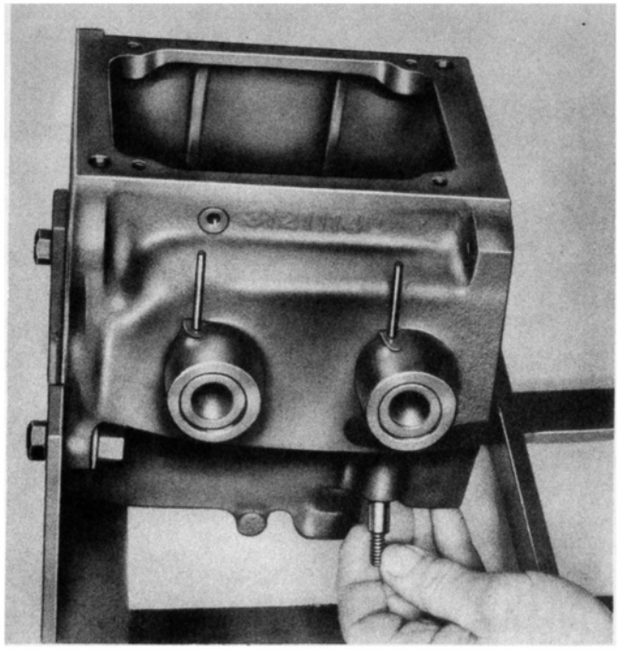


FIGURE 43—*Removing the Speed Finder and Interlock Poppets.*

CLEANING AND INSPECTING PARTS

With the transmission completely disassembled, all parts should be carefully cleaned so that they can be thoroughly examined.

Gears

Wash all gears in a cleaning solution. Inspect for worn, cracked, or chipped teeth. Slide each gear onto a new shaft. If it appears to be loose, it must be replaced.

NOTE: *Whenever any transmission gear requires replacement, the gear with which it meshes should also be replaced.*

Bearings

Bearings must be handled with great care. Wrap in a clean cloth or paper until they can be washed.

To wash a bearing, submerge it in a cleaning solution that is absolutely free of dirt and rotate it to flush away all oil and dirt. Dry the bearing with care.

Carefully examine each bearing for cracked races, worn, or scored balls.

Main Shaft

Install the splined gears onto the shaft to be sure they slide on and off easily. They should fit smoothly without excessive play between the splines. If the fit is tight, look for burred edges on the splines.

Synchro-Clutch and Friction Rings

Carefully inspect the synchro-clutch and friction rings. Slide the rings on the cones of the second

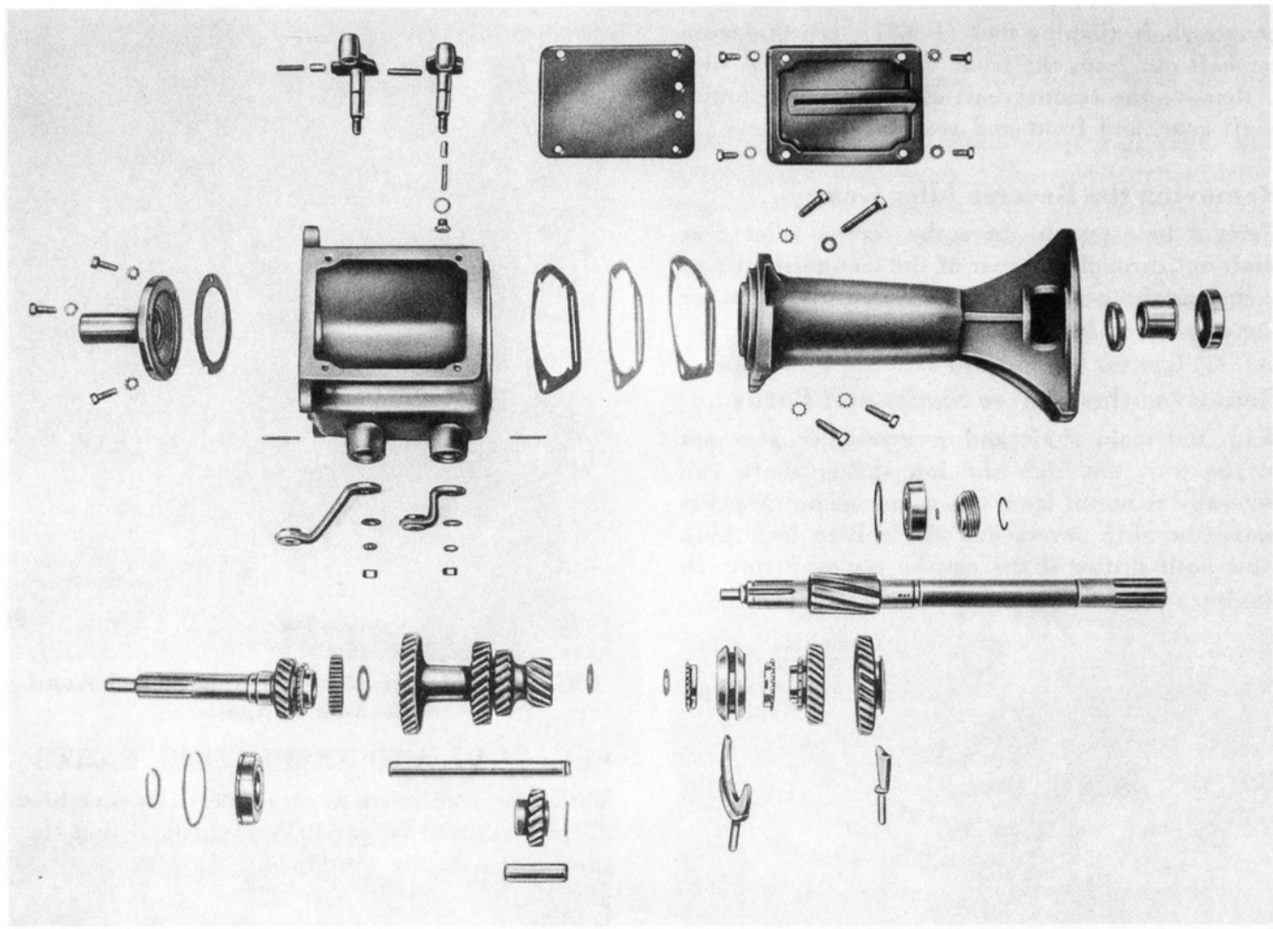


FIGURE 44—*"Statesman" Series Transmission.*

speed gear and the clutch shaft. Replace rings, if there is excessive wear on the taper.

Transmission Case

Examine the surfaces of the bearing recesses in the transmission case for wear or scoring which indicates that the bearing has been revolving in its housing. Examine the case for cracks or other defects.

Be certain that all parts of the case are thoroughly clean before and during reassembly.

REASSEMBLY

When reassembling the transmission, always use new gaskets and oil seals.

Reinstalling the Shifter Shafts and Forks

Put the interlock poppet in the hole in the boss of the case being sure that it is free to move back and forth. Then install the second and high speed finder spring and poppet in the case.

Install the second and high shifter shaft, and at the same time, press the second and high speed finder into the case to permit the quadrant to contact the case. Set the quadrant in the neutral position.

NOTE: *If the shifter shaft seals were removed, replace them using Tool J-2633.*

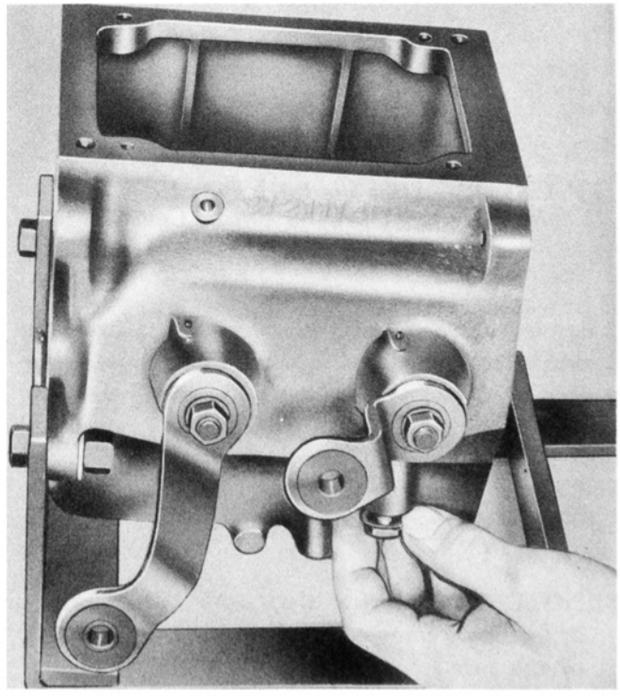


FIGURE 45—*Installing the Speed Finder and Shifter Shafts.*

Install the low and reverse shifter shaft and replace the two shifter lock pins and shifter levers.

Install the low speed finder and spring from the bottom of the case securing it with the copper washer and plug (Fig. 45).

Reinstalling the Reverse Idler Gear

Install the reverse idler gear with the beveled side of the gear teeth to the front. Then drive the reverse idler gear shaft in from the rear.

The notch for the shaft lock plate should be toward the rear and pointing in the direction of the countershaft. This avoids the necessity for turning the shaft after it has been installed.

Drive the shaft in until the notch for the lock plate is flush with the case.

Installing the Countershaft Gear

Apply a heavy lubricant to the case side of the front thrust washer, and install the washer so that the lip is lined up with the slot in the transmission case.

Lower the countershaft gear into the case with the large gear to the front being careful to avoid dislodging the thrust washer.

After the gear is in position, insert the rear thrust washer through the bearing hole in the rear of the case. Then insert the countershaft aligning tool (J-2632) with the large end of the tool to the rear, allowing the countershaft gear to rest on the small diameter of the tool.

Raise the countershaft gear in line with the countershaft hole, positioning the countershaft gear with the large end of aligning tool (J-2632). Be sure the thrust washers are seated in the notches in the case. Then with a plastic or lead hammer, tap the countershaft into position from the rear. Hold the aligning tool in constant pressure against the shaft while driving it in. Be sure that the locking groove in the shaft will line up with the locking groove in the reverse idler gear shaft.

Tap the countershaft in until the lock plate can be installed. Insert the lock plate between the two shafts and tap it into position (Fig. 46). If the plate tends to slip out, tap the ends of the two shafts just enough to bind the plate against the case.

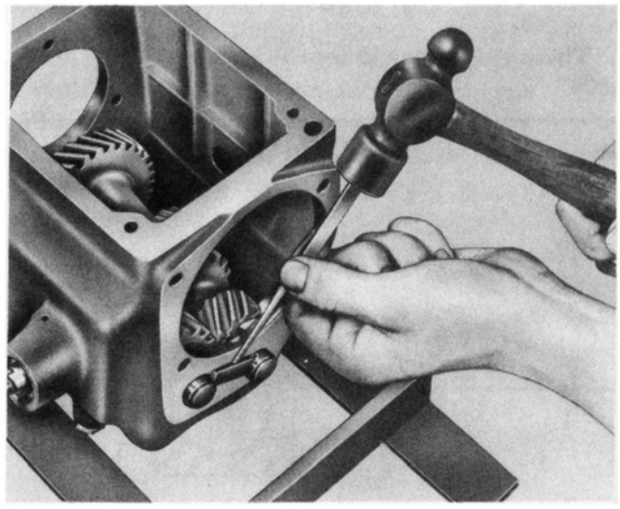
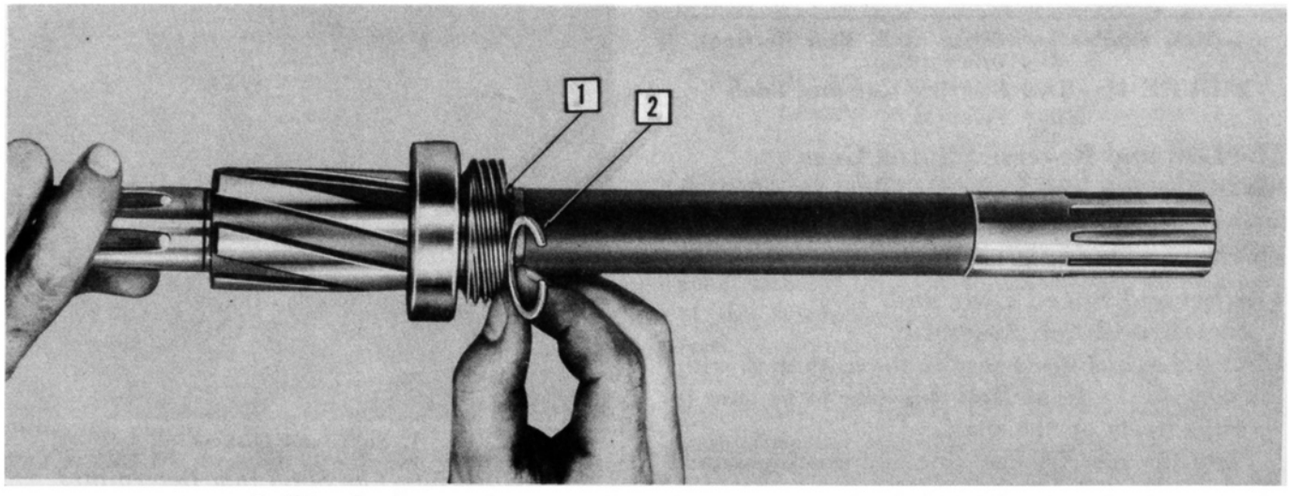


FIGURE 46—*With the Grooves in the Reverse Idler Shaft and the Countershaft Lined Up, Tap the Lock Plate in Position.*

Reassembling the Gears on the Main (Spline) Shaft

Press the rear transmission bearing (oil baffle forward) onto the main shaft until it is tight against



1. Ring Groove
2. Snap Ring

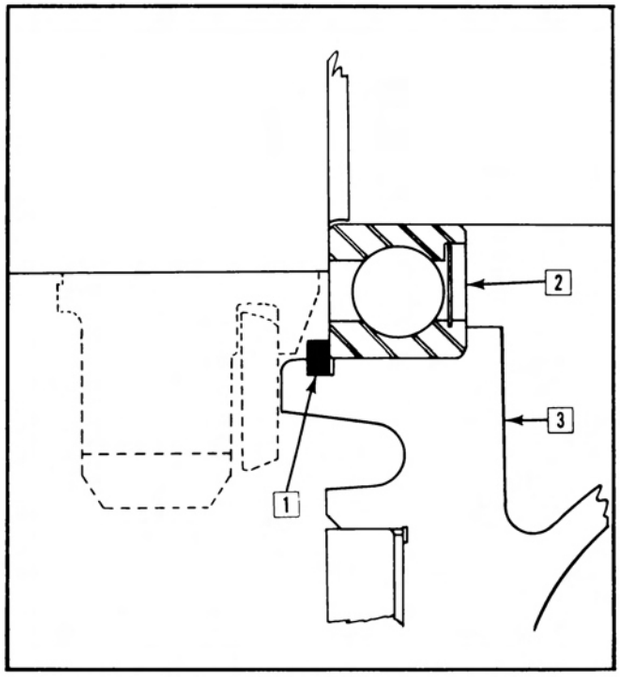
FIGURE 47—*With the Rear Bearing and Speedometer Drive Gear in Place, Install a Snap Ring Just Large Enough to Fill the Snap Ring Groove.*

the shoulder of the shaft. Then place the Woodruff key in the shaft keyway and install the speedometer drive gear on the shaft, pressing it tight against the rear bearing.

Install a snap ring just large enough to fill the groove in the shaft. These rings come in three thicknesses .087″, .090″, and .093″ (Fig. 47).

With the rear bearing and speedometer drive gear locked in place, install the shaft through the front end of the rear bearing cap. Be sure the bearing is firmly seated in the cap, and then install the transmission rear bearing lock ring. This ring should fill the lock ring groove so that there is no end play in the main shaft and bearing assembly (Fig. 48).

These rings come in four thicknesses .093″, .096″, .099″, and .102″.



1. Rear Bearing Lock Ring 2. Rear Bearing
3. Rear Bearing Cap

FIGURE 48—*Rear Bearing Cap and Lock Ring Assembly.*

The Low and Reverse Sliding Gear

Install the low and reverse sliding gear on the main shaft with the shifting collar to the rear. The gear must slide freely on the splines.

The Second Speed Gear and Synchro-Clutch Assembly

Place the second speed gear on the main shaft with the cone to the front. Test this gear to be sure it revolves freely on the shaft.

Place the rear friction ring and synchro-clutch on the main shaft. Care must be taken to be sure the three blocks in the synchro-clutch are in line with the slots in the friction ring. The main shaft snap ring can now be installed.

When the synchro-clutch hub is pressed tight against the snap ring, there should be .003″ to .010″ clearance between the second speed gear and the shoulder on the main shaft (Fig. 49).

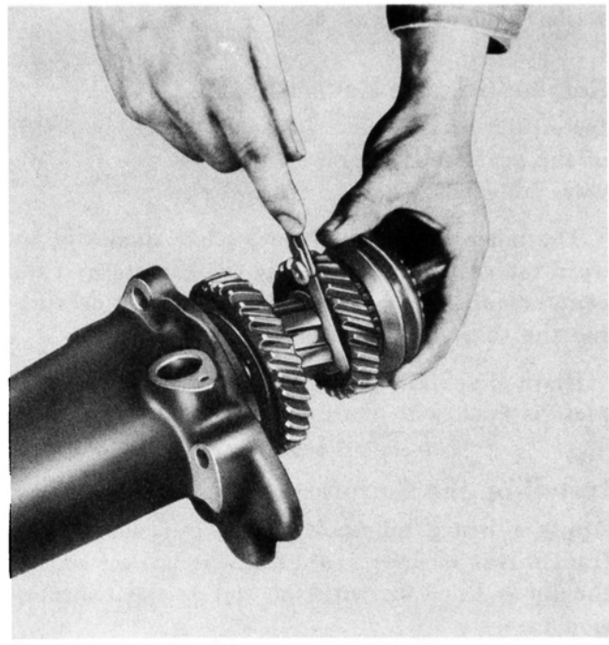
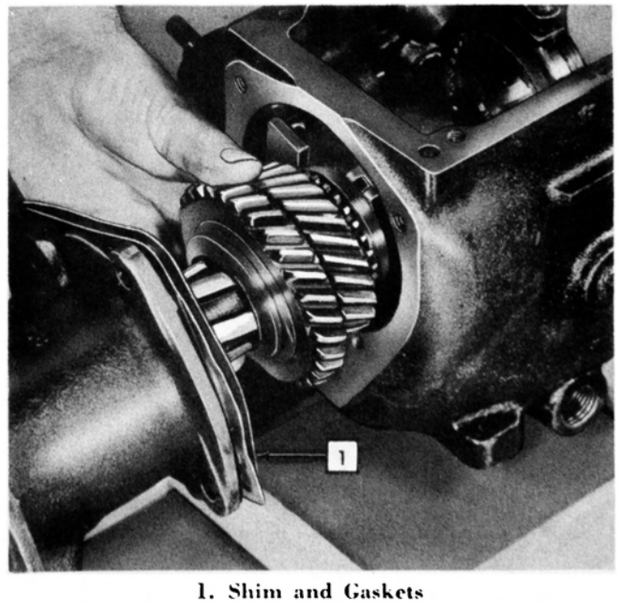


FIGURE 49—*To Measure the Second Speed Gear End Play, Use a Feeler Gauge Between the Gear and the Shoulder on the Main Shaft.*

Reinstalling the Main Shaft Assembly

To reinstall the main shaft assembly, reverse the removal procedure as outlined in the fore part of this section.



1. Shim and Gaskets

FIGURE 50—*The Shim that Determines Friction Ring Clearance Goes Between the Rear Bearing Cap and the Case. Gaskets are Placed on Each Side of the Shim.*

TRANSMISSION SECTION
("Statesman")

The Rear Bearing Cap Shims

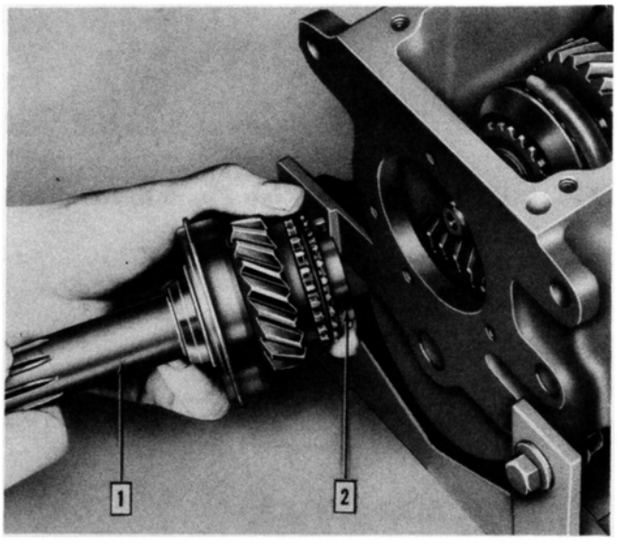
Place a .010″ shim, with a gasket on each side of the shim, between the rear bearing cap and the transmission case (Fig. 50). This is the shim that determines the clearance between the front friction ring and the main drive gear. This clearance will be inspected and adjusted after the assembly is completed.

Reinstalling the Clutch Shaft Assembly and the Transmission Front Bearing

If the lock ring on the outside of the front ball bearing has been removed, or if a new bearing is being installed, place a .077″ thickness lock ring in the bearing groove. Then press the bearing onto the clutch shaft (snap ring groove to the front) tight against the shoulder. Install a snap ring just thick enough to fill the groove in the shaft. These snap rings come in three thicknesses .092″, .095″, and .098″.

Before installing the clutch shaft assembly, install the front friction ring on the cone of the clutch shaft.

Then install the clutch shaft assembly in the case lining up the synchro-clutch blocks with the slots in the front friction ring (Fig. 51).



1. Clutch Shaft
2. Friction Ring

FIGURE 51—*With the Friction Ring Placed on the Cone of the Clutch Shaft, Install the Clutch Shaft Assembly.*

The Front Bearing Cap

With the clutch shaft in place, use a new gasket and install the bearing cap lining up the oil return recess with the hole in the case. Then replace the cap screws.

CAUTION: *When tightening up the cap screws, note whether the cap presses against the bearing or against the transmission case first. If it presses against the bearing; insert additional gaskets between the cap and the case.*

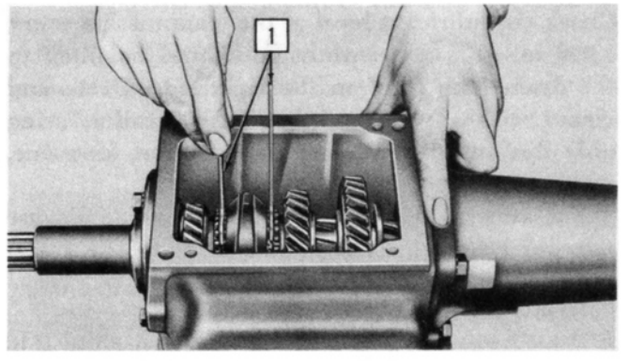
INSPECTING CLUTCH AND MAIN SHAFT CLEARANCES

Clutch Shaft End Play

End play in the clutch shaft is controlled by three factors: depth of the counterbore in the front bearing cap, the thickness of the front bearing lock ring, and the thickness of the gasket used between the bearing cap and the transmission case. This end play should not be more than .005″, preferably .000″.

Friction Ring Clearance

With the clutch and main shaft assembled in the case, hold the rear bearing cap tight against the case. Measure the clearance of the friction rings with the friction ring clearance gauges (J-1410) as shown in Figure 52. These clearances should be between .060″ and .080″. If it is less, add shims between the rear bearing cap and the case. If it is excessive, remove gaskets or shims. Gaskets must be used on both sides of the shim.



1. Tool J-1410

FIGURE 52—*Gauging Front Friction Ring Clearance. It Should be Between .060″ and .080″.*

Alignment of the Second and High Speed Shifter Fork

With the transmission fully engaged in second gear, measure the clearance between the rear face of the synchro-clutch shift collar and the front face of the second speed gear (Fig. 53). This clearance should be not less than .028″. If it is less, either the shifter fork or the quadrant has been distorted and should be replaced.

Before replacing the cover plate, shift the gears in all positions, turning the transmission clutch shaft to see if the gears mesh correctly and turn freely. Lubricate the bearings and thrust surfaces with engine oil.

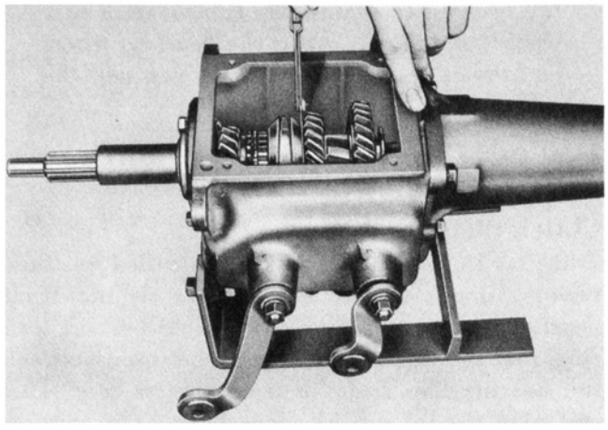


FIGURE 53—*With the Transmission in Second Gear, the Clearance Between the Synchro-Clutch Shift Collar and the Second Speed Gear Should Not be Less Than .028".*

Place the cover gasket on the case with the vent hole to the *rear*. Then install the transmission cover making sure that the vent hole in the cover is clear and to the *front*.

Then install a new rear oil seal using tool J-1556-3 Adapter and J-1648 Driver.

Lubrication of the Transmission

Check the lubricant level of the transmission every 1,000 miles. The transmission should be filled to the drain plug level on the right side. Drain and clean twice a year, or every 10,000 miles, using only flushing oils. Do not use gasoline, kerosene, steam, etc.

For atmospheric temperatures above 32°F., use mineral gear lubricant SAE No. 90 in the transmission.

Below 32°F., use SAE No. 80.

When difficulty in shifting is experienced in sub-zero temperatures, dilute the transmission oil as required, using light engine oil.

CAUTION: *Do not use gear oil with extreme pressure lubricants or other compounded agents.*

Transmission capacity (U. S.) 2¼ pints.

1952 "RAMBLER"

"RAMBLER" SERIES TRANSMISSION REMOVAL

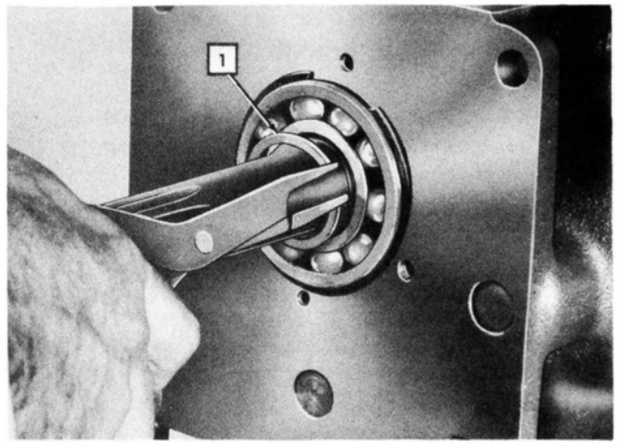
To remove the transmission, disconnect the rear spring front spring eye brackets from the underside of the body floor pan, rear shock absorbers at the axle tube, rear brake hose bracket, and the hand brake cable at the equalizer. Then slide the rear axle to the rear to remove the front universal joint from the transmission main shaft. After removing two bolts holding the transmission to the bell housing, install guide-pins (Tool J-1434) to avoid any possibility of damaging the clutch shaft or clutch shaft pilot bearing while removing the transmission.

Disassembling the Transmission

With the transmission assembly completely drained of its lubricant and set up in a transmission stand, remove the case cover noting the stamping marked "FRONT" on both the cover and the gasket.

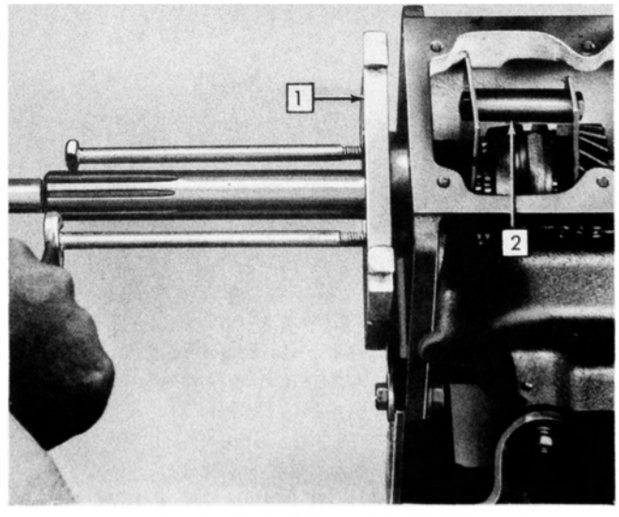
Removing the Clutch Shaft Assembly

After removing the front bearing cap, remove the clutch shaft snap ring and the bearing lock ring (Fig. 54).



1. Snap Ring

FIGURE 54—*Use Snap Ring Pliers to Remove the Snap Ring.*



1. Bearing Puller (J-1298N)
2. Thrust Yoke (J-2040)

FIGURE 55—*Use Bearing Puller (J-1298N) Together With Thrust Yoke (J-2040) to Pull the Front Bearing and Prevent Damage to the Synchro-Clutch.*

The front bearing can be removed from the clutch shaft by using bearing puller (J-1298N), together with a thrust yoke (J-2040) to prevent damage to the synchronizer clutch (Fig. 55).

The oil slinger, being a free fit on the clutch shaft, can then be removed.

Remove the rear bearing cap and oil seal assembly. Note the copper washer on the long cap screw. This cap screw is below the oil level and the copper washer is used to prevent oil leakage. The transmission rear bearing and speedometer gear will be retained on the main shaft by a snap ring (Fig. 56).

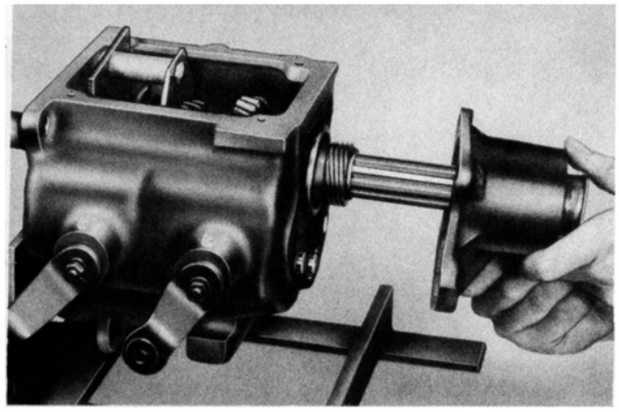


FIGURE 56—*Remove the Rear Bearing Cap and Oil Seal.*

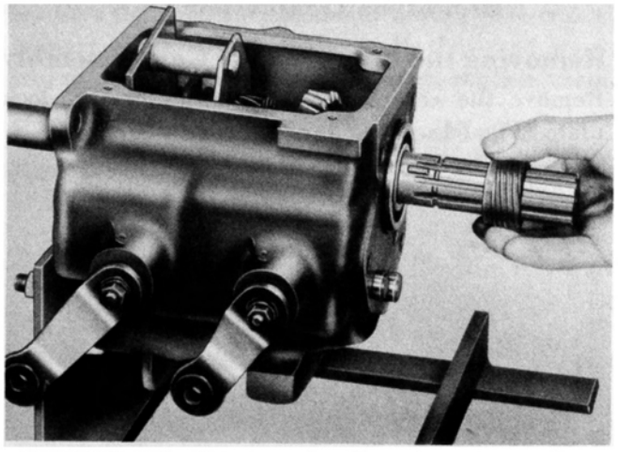


FIGURE 57—*Remove the Speedometer Drive Gear and Woodruff Key.*

After removing the rear bearing cap, drive out the old oil seal. A new oil seal will be used in reassembly.

Now remove the snap ring retaining the speedometer drive gear in position. This snap ring is serviced in four different sizes, and must be used as required on assembly to avoid any possible end play of the speedometer drive gear. The speedometer drive gear is also retained with a Woodruff key (Fig. 57).

To remove the transmission clutch shaft, the main shaft assembly must be moved to the rear of the transmission case about ½". Then by lowering the front end of the clutch shaft and raising the rear end over the countershaft gear, the shaft can be removed from the case. Be careful not to nick the gear teeth as it is being removed (Fig. 58).

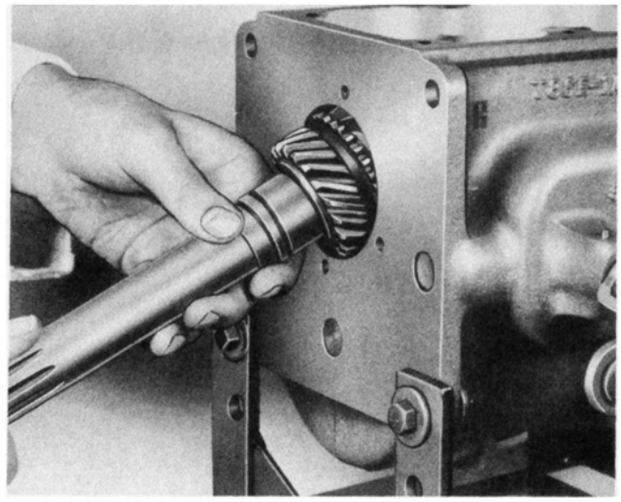
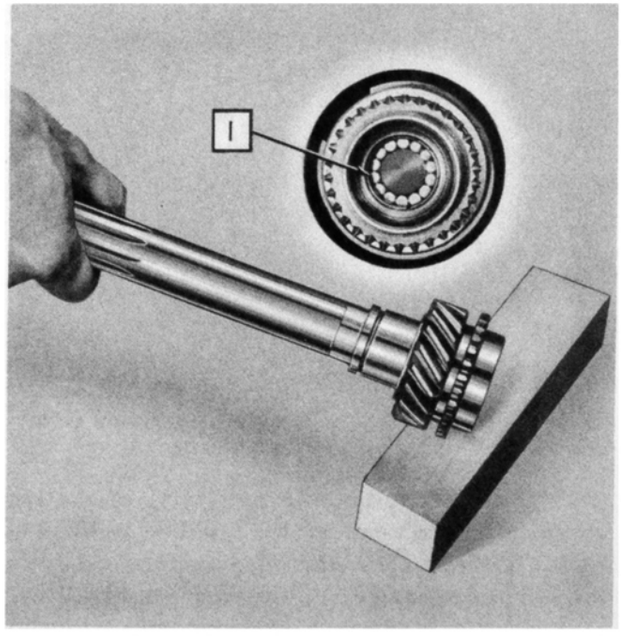


FIGURE 58—*Remove the Clutch Shaft.*

Clutch Shaft Roller Bearings

Inside the rear end of the clutch shaft are thirteen roller bearings. These form the front bearing assembly for the main shaft. Worn or loose rollers



1. Roller Bearings

FIGURE 59—*Bearing Rollers Inside the Clutch Shaft Hold Themselves in Place by a "Keystone" Effect. Jarring the Shaft Will Show if These Rollers Are Loose.*

will result in a noisy transmission. Inspect for worn, pitted, or scored surfaces (Fig. 59).

Disassembling the Main Shaft Assembly

After the clutch shaft is removed, remove the second and high shifter fork. Tilt the main shaft and remove the snap ring, synchro-clutch, second speed gear, and low and reverse gear (Figs. 60, 61, 62, and 63).

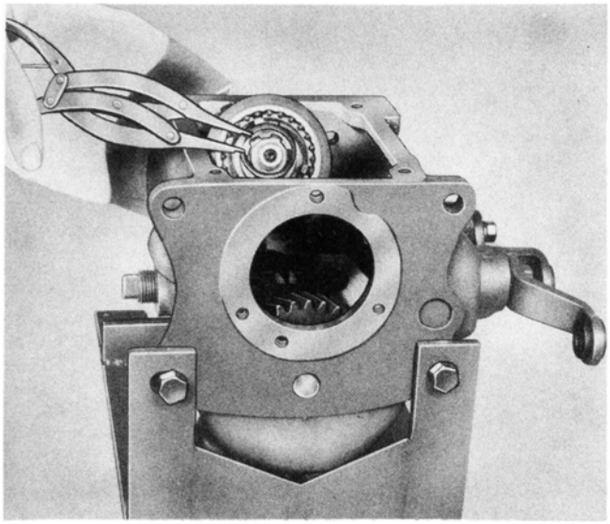


FIGURE 60—*Remove the Snap Ring From the Main Shaft and Remove the Synchro-Clutch.*

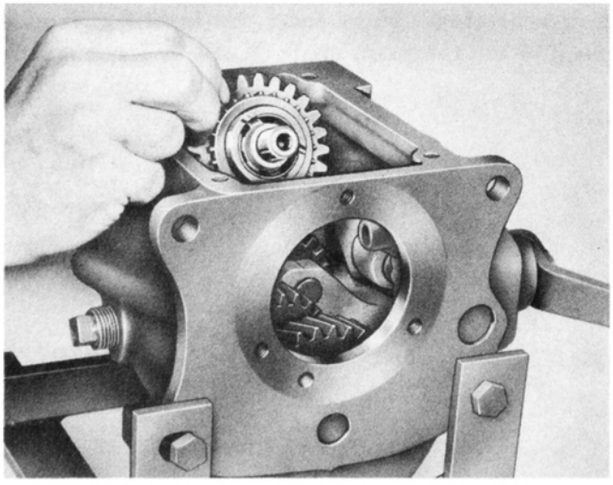


FIGURE 61—*Remove the Second Speed Gear From the Main Shaft.*

The hub section and the outer ring of the synchronizer clutch assembly are matched and lapped when fabricated by the manufacturer and are marked accordingly. The etching marks will correspond when properly assembled insuring smooth sliding action during shifting into second and third speed.

After the removal of the main shaft and bearing, press the bearing from the main shaft.

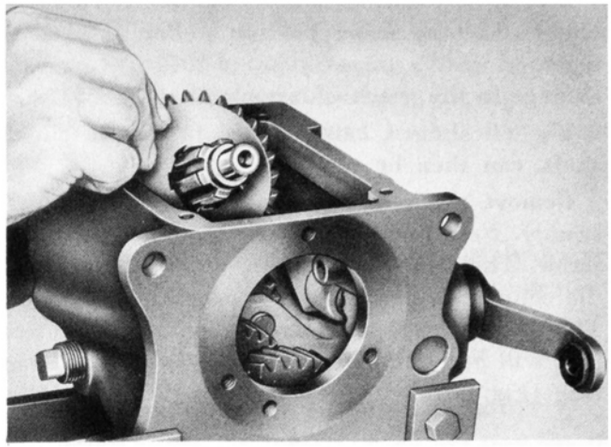


FIGURE 62—*Slide the First and Reverse Gear From the Main Shaft.*

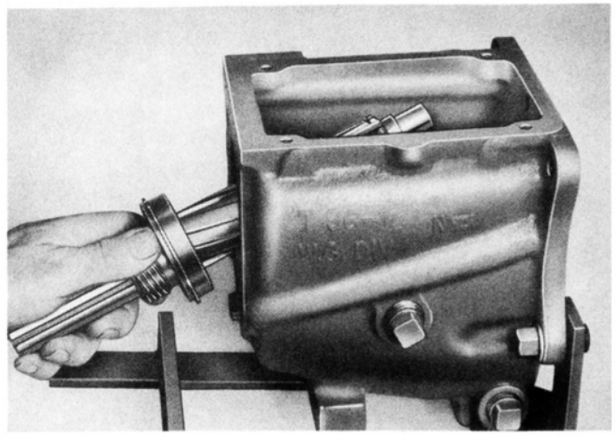


FIGURE 63—*The Main Shaft and Rear Bearing Assembly Can Then be Removed From the Rear of the Transmission Case.*

Removing the Countershaft Gear Assembly

Remove the reverse idler and countershaft lock plate (Fig. 64).

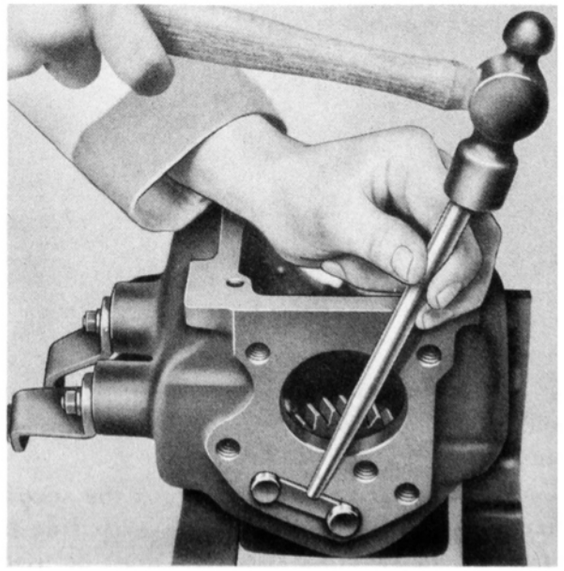
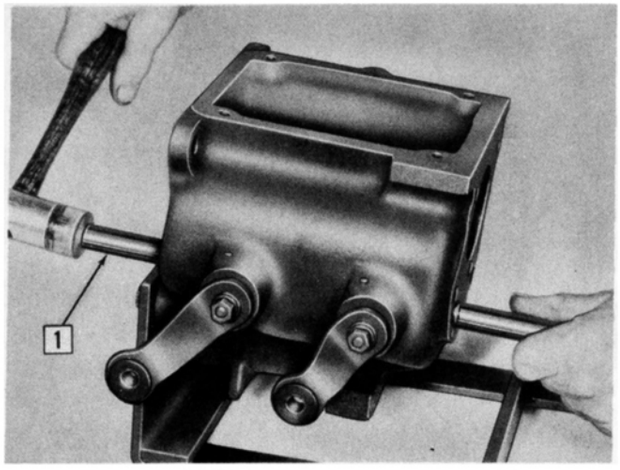


FIGURE 64—*Remove the Lock Plate.*

To maintain the position of the needle bearings in the countershaft gear, drive the countershaft out of the rear of the case using a dummy shaft machined to .677" x 5⅞" (Fig. 65).

With the dummy shaft in place, lower the countershaft gears to the bottom of the case.



1. Dummy Shaft

FIGURE 65—*Use a Dummy Shaft Machined to .677" x 5⅞" to Remove the Countershaft.*

Reverse Idler Gear

Remove the reverse idler gear by driving the shaft out the rear of the case with a brass drift (Fig. 66).

Take care not to damage the end of the shaft as you are driving it out. When the shaft is driven out, lift the reverse idler gear from the case. Then remove the countershaft gear assembly (Fig. 67).

Note carefully the position of the three thrust washers to avoid misplacement during reassembly. Inspect these thrust washers. If they are worn, scored, or damaged in any manner, replace them.

Removing the Interlock Assembly

Remove the outer shift levers and shifter shaft lock pin.

Remove the shifter shafts from the inside of the case slowly to catch the two interlock ball bearings as the shafts are being removed. The interlock sleeve and spring can then be removed.

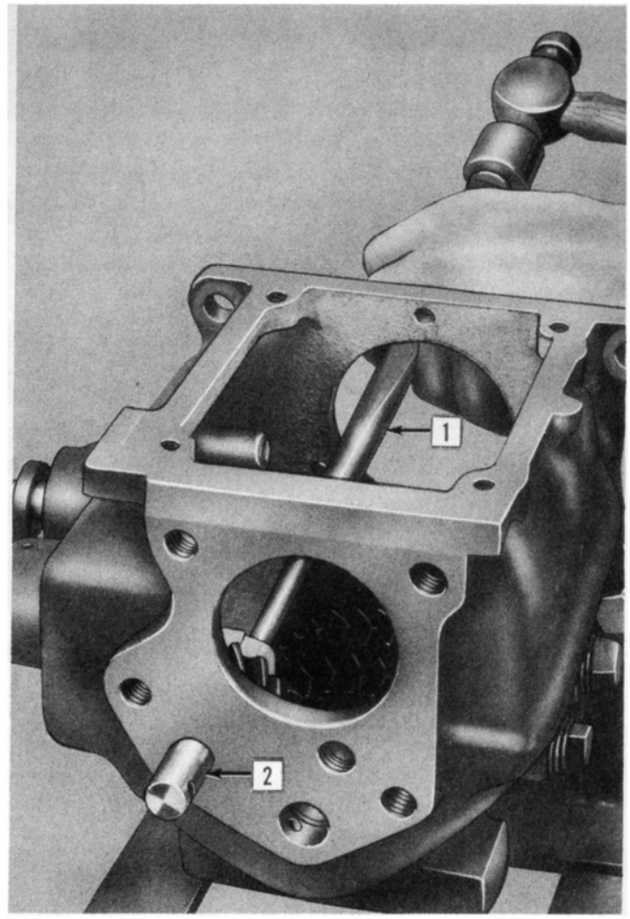
Now remove the shifter shaft oil seals from the case. This completes the disassembly of the transmission.

CLEANING AND INSPECTING PARTS

With the transmission completely disassembled, all parts should be carefully cleaned so that they can be thoroughly examined.

Gears

Wash all gears in a cleaning solution. Inspect for worn or chipped teeth. Slide each gear onto a new shaft. If it appears to be loose, it must be replaced.



1. Brass Drift
2. Idler Gear Shaft

FIGURE 66—*To Remove the Reverse Idler Gear Shaft, Drive it Out the Rear of the Case With a Brass Drift.*

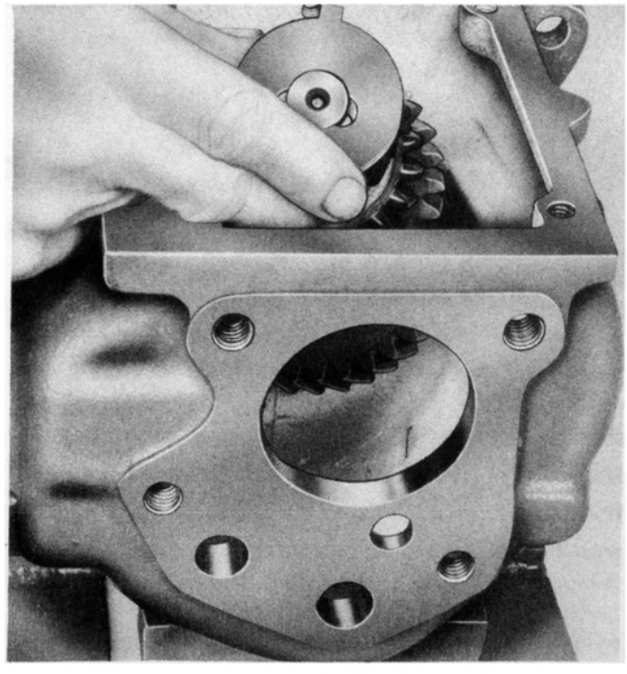


FIGURE 67—*Removing the Countershaft Gear Assembly.*

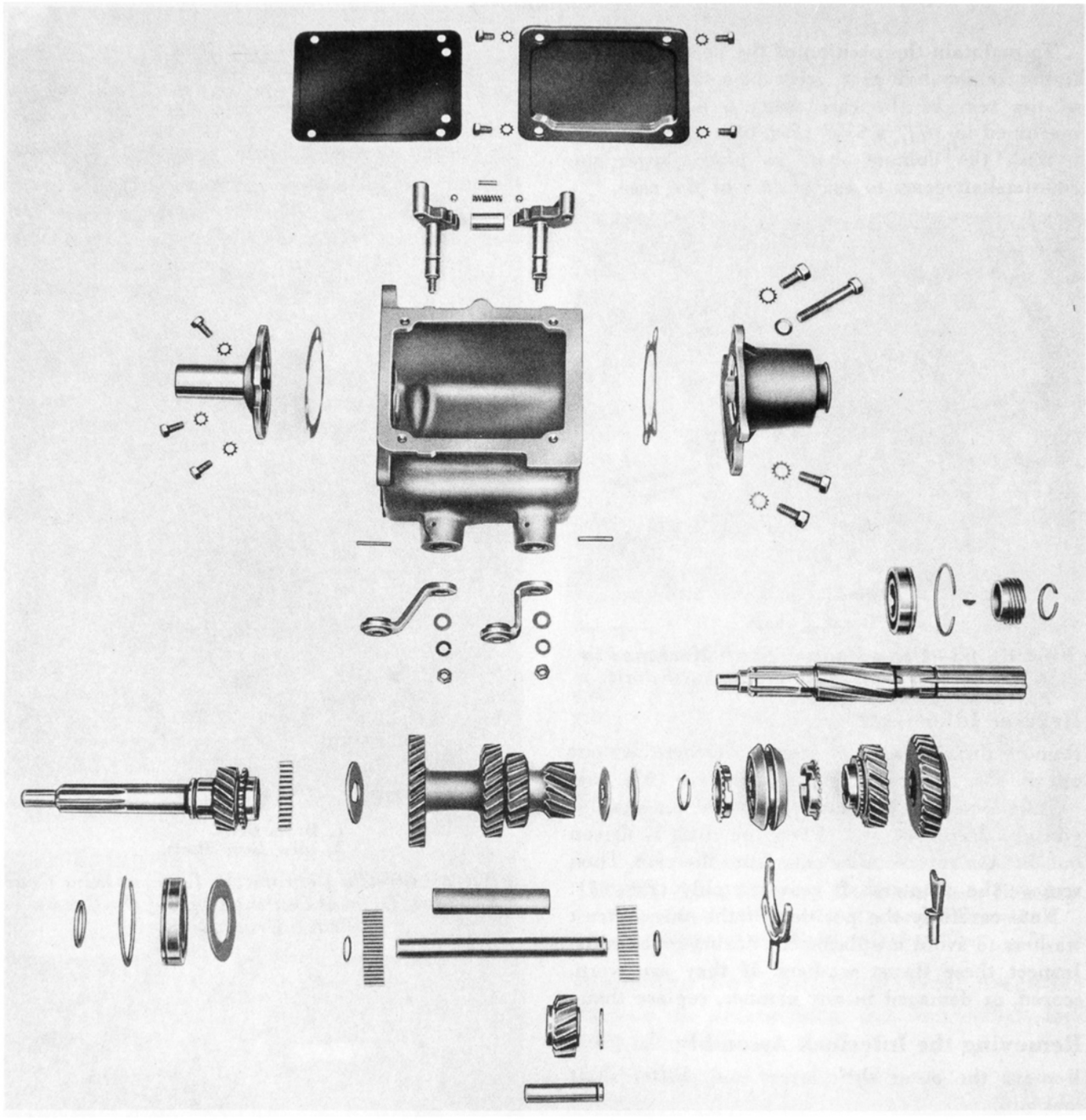


FIGURE 68—*"Rambler" Series Transmission.*

NOTE: *Whenever any transmission gear requires replacement, the gear with which it meshes should be replaced also.*

Bearings

Bearings must be handled with great care. Wrap them in a clean cloth or paper until they can be washed.

To wash a bearing, submerge it in a cleaning solution that is absolutely free of dirt and rotate it to flush away all oil and dirt. Dry the bearing with care.

Carefully examine each bearing for cracked races, worn, or scored balls.

Main Shaft

Install the gears onto the main shaft to be sure they slide on and off easily. They should fit smoothly without excessive play between the splines. If the fit is tight, look for burred edges on the splines.

Synchro-Clutch and Friction Rings

Carefully inspect the synchro-clutch and friction rings. Slide the rings on the cones of the second speed gear and the clutch shaft. Replace rings if there is excessive wear on the taper.

Transmission Case

Examine the surfaces of the bearing recesses in the transmission case for wear or scoring which indicates that the bearing has been revolving in its housing. Examine the case for cracks or other defects.

Be certain that all parts of the case are thoroughly clean before and during assembly.

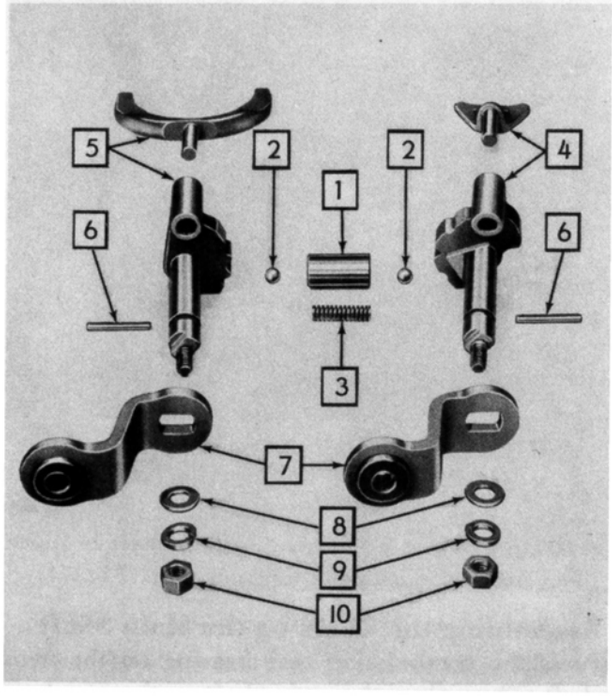
REASSEMBLY

When reassembling the transmission, always use new gaskets and oil seals.

Shifter Shafts and Levers

Install new shift shaft oil seals.

Then reinstall the low and reverse shift shaft, interlock sleeve, ball bearing, and spring. With the second and high shift shaft installed against the case, place the second ball bearing in position. While compressing the interlock spring with finger pressure, locate the ball in the detent of the quadrant.



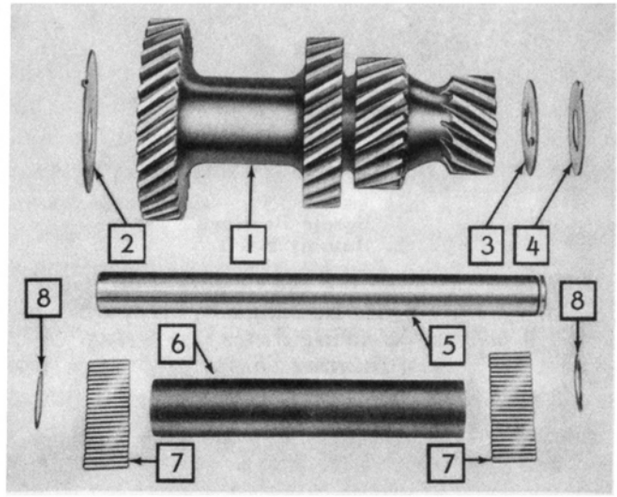
1. Interlock Sleeve
2. Interlock Balls
3. Interlock Spring
4. Low and Reverse Shift Shaft and Fork
5. High and Second Shift Shaft and Fork
6. Locking Pins
7. Outer Shift Shaft Levers
8. Washers
9. Lock Washers
10. Nuts

FIGURE 69—*Assembly Sequence of the Shifter Mechanism.*

Shift the transmission into any one gear and, with one end of the interlock sleeve against the shifter shaft quadrant, the clearance between the opposite end of the sleeve and the quadrant on the other shaft should be from .001″ to .007″. After installing the correct size sleeve, lock the shifter shafts in place with lock pins and install the shift levers and forks.

Reinstalling the Countershaft Gear and Shaft

To hold the countershaft needle bearings, spacer, and washers in place while installing the countershaft gear, load the countershaft gear by using a dummy shaft machined to .677″ x 5⅞″ (Figs. 70 and 71).



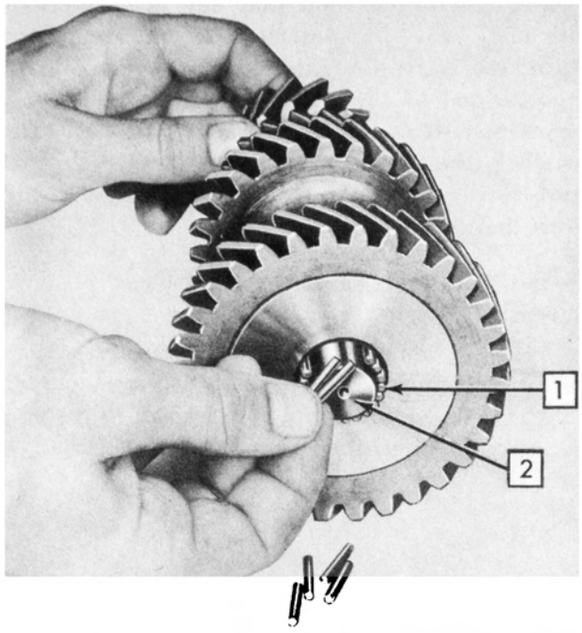
1. Countershaft Gear
2. Front Thrust Washer
3. Bronze Rear Thrust Washer
4. Rear Thrust Washer
5. Countershaft
6. Spacer
7. Needle Bearings
8. Bearing Rings

FIGURE 70—*Countershaft Assembly Sequence.*

After installing the bearings in the countershaft gear, and holding it in such a manner so as not to drop the dummy shaft, install the thrust washers. The two small projections on the face of the bronze rear thrust washer must index with the grooves in the countershaft gear. The front bronze thrust washer must index with the transmission case. Position the large thrust washer and install the assembly in the bottom of the case (Fig. 72).

Reinstalling the Reverse Idler Gear

Install the reverse idler gear with the chamfered side of the teeth (or the hub section) to the front of the case. Then drive the reverse idler shaft in from the rear of the case with the notched end of the shaft to the rear. The notch should face the countershaft (Fig. 73).



1. Needle Bearings
2. Dummy Shaft

FIGURE 71—*Loading the Countershaft Gear With the Needle Bearings, Spacer, and Washers, (Bearing Rings) by Using a Dummy Shaft.*

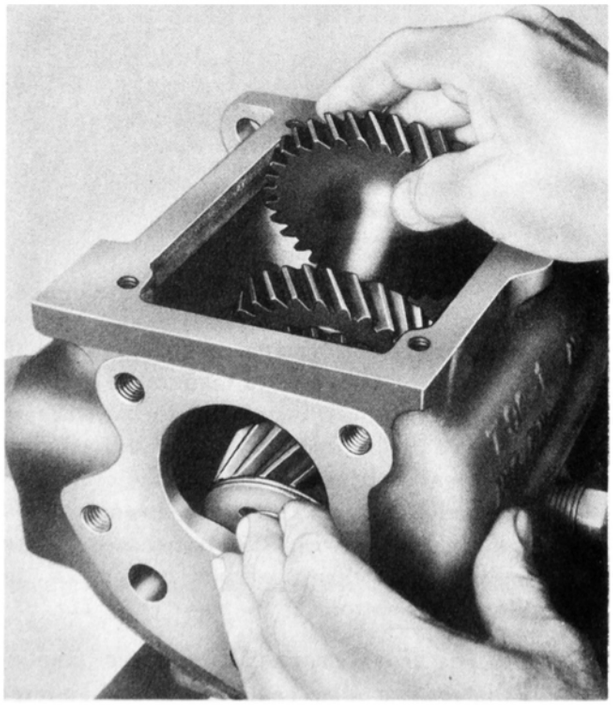
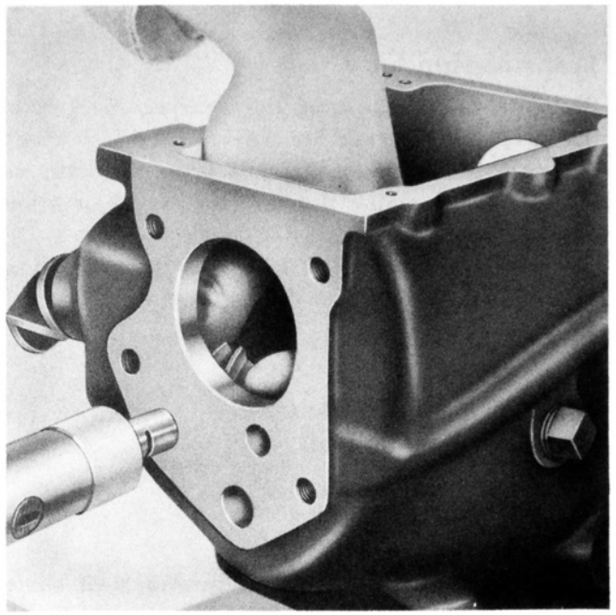


FIGURE 72—*Installing the Countershaft Gear Assembly in the Case.*

After aligning the slots in the countershaft and the reverse idler shaft, position the countershaft



1. Reverse Idler Gear Shaft

FIGURE 73—*Installing the Reverse Idler Gear.*

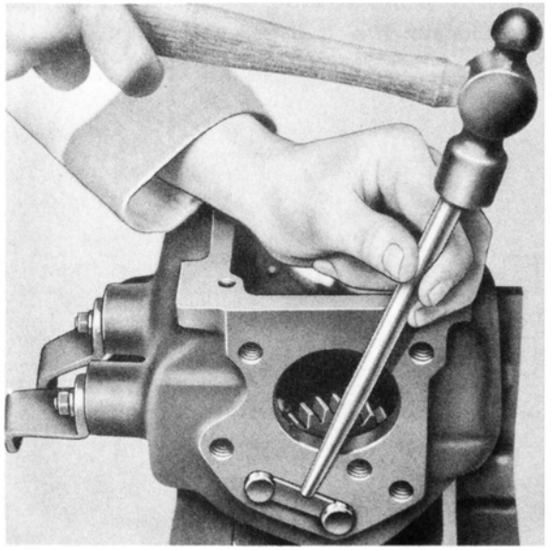


FIGURE 74—*Install the Lock Plate in the Grooves in the Countershaft and Reverse Idler Shaft.*

gear assembly and drive the countershaft in place. Then insert the lock plate in position (Fig. 74).

Assembling the Gears on the Main Shaft

Press the transmission rear bearing on the main shaft. Then place the main shaft in the case from the rear. Install the first and reverse sliding gear on the main shaft (Fig. 75).

NOTE: *To avoid hardship in assembling, the first and reverse sliding gear should be installed on the main shaft a number of times while out of the case.*

Now install the second speed gear and the synchro-clutch assembly on the main shaft. Then install the snap ring.

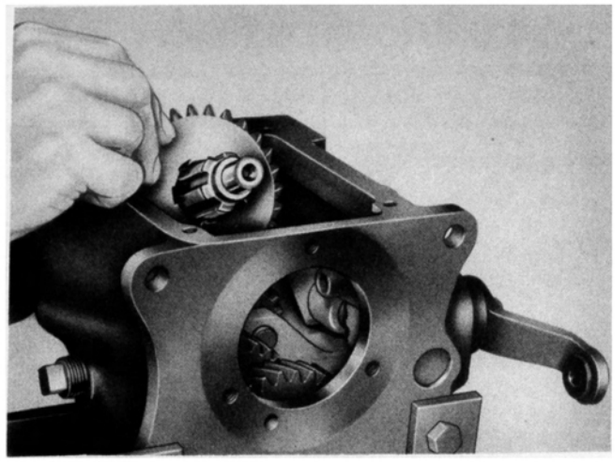


FIGURE 75—*Place the First and Reverse Sliding Gear on the Main Shaft.*

When the synchro-clutch hub is pressed tight against the snap ring, there should be a .003″ to .010″ clearance between the second speed gear and the shoulder of the main shaft.

Installing the Clutch Shaft Assembly

Insert the thirteen clutch shaft bearings in the clutch shaft. A coat of lubriplate will hold them in position. Then install the front friction ring and the clutch shaft on the main shaft (Fig. 76).

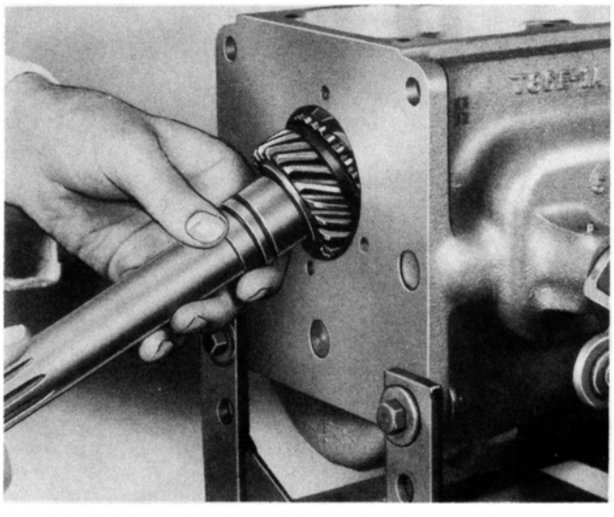


FIGURE 76—*Installing the Clutch Shaft.*

Now move the main shaft rear bearing into the transmission case and align the shifter forks and gears guiding the end of the main shaft into its bearing in the clutch shaft (Fig. 77).

Install the speedometer drive gear. A Woodruff key holds the speedometer gear from rotating on the main shaft. Then install a main shaft snap ring to hold the speedometer gear in position.

When installing the rear bearing cap, note that the depth of the counter bore in the rear bearing cap, the thickness of the rear bearing lock ring,

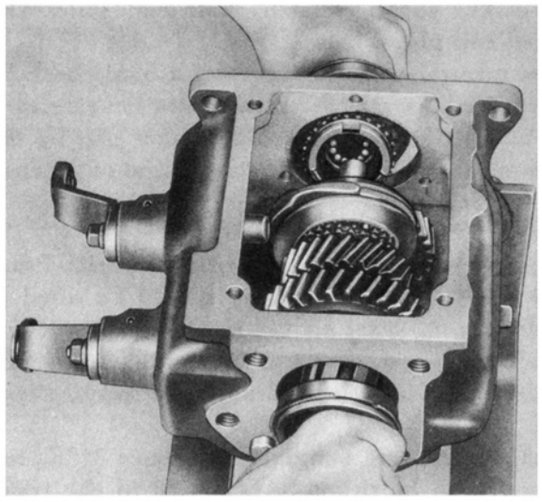


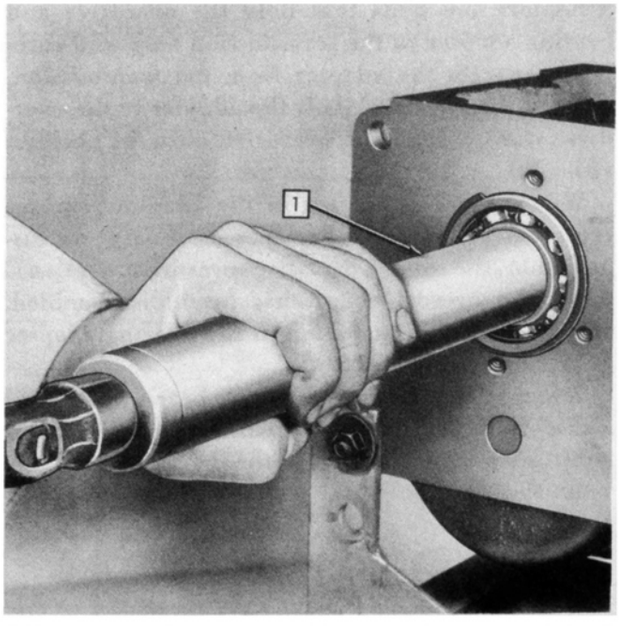
FIGURE 77—*Guide the End of the Main Shaft Into Its Bearing in the Clutch Shaft.*

and the rear main shaft snap ring all control main shaft end play. The rear bearing lock ring is available in two thicknesses .076″ and .093″. The rear main shaft snap ring is available in four thicknesses .087″, .090″, .093″, and .096″.

Use Tool J-4485 rear oil seal installer to install a new rear bearing cap oil seal.

Place the oil slinger on the clutch shaft with the concave side toward the rear. The front bearing and lock ring can be installed with Tool J-2995, together with thrust yoke J-2040 (Fig. 78). Then install the clutch shaft snap ring using either snap ring pliers or Tool J-2995 Snap Ring Installing Set.

Place a new gasket between the bearing cap and case and install the bearing cap. The thickness of



1. Tool J-2995

FIGURE 78—*Installing Clutch Shaft Bearing.*

this gasket governs clutch shaft end play. The desired end play is .000".

The transmission only requires a final check by shifting in all gears. Check the operation carefully, then install the case cover and gasket placing the stamping marked "FRONT" to the front of the case.

Lubrication of the Transmission

Check the lubricant level of the transmission every 1,000 miles. The transmission should be filled to the drain plug level on the right side. Drain and clean twice a year, or every 10,000 miles, using only flushing oils. Do not use gasoline, kerosene, steam, etc.

For atmospheric temperatures above 32°F., use mineral gear lubricant SAE No. 90 in the transmission.

Below 32°F., use SAE No. 80.

When difficulty in shifting is experienced in sub-zero temperatures, dilute the transmission oil as required, using light engine oil.

CAUTION: *Do not use gear oil with extreme pressure lubricants or other compounded agents.*

Transmission capacity (U.S.) 1½ pints.

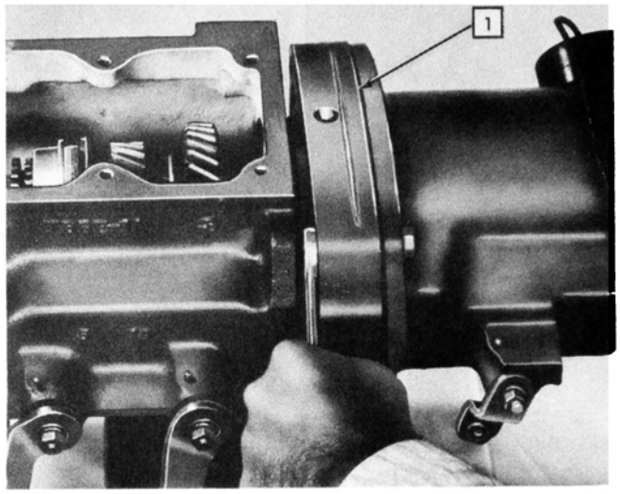
OVERDRIVE TRANSMISSION

On overdrive equipped transmissions, the overhaul procedure is the same as outlined in the standard transmission section with the following exceptions.

Remove the bolts that hold the overdrive and bearing adapter to the transmission case, and carefully separate the adapter from the transmission. As they are separated, bolt the adapter to the overdrive case to keep the overdrive parts in position (Fig. 79).

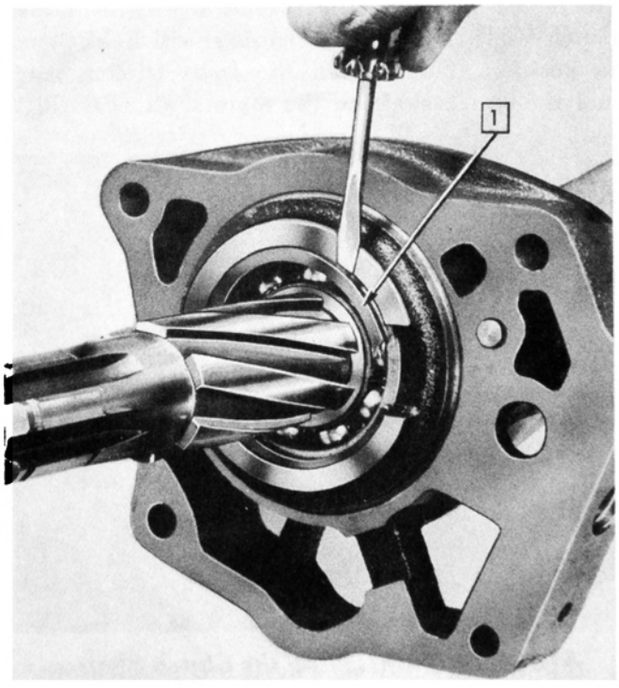
Where the ball bearing in the adapter requires replacement, it then becomes necessary to disassemble the overdrive (See overdrive section). After the overdrive unit has been disassembled, remove the large snap ring in the bearing adapter (Fig. 80).

Remove the main shaft ball bearing, and oil baffle from the adapter. Then remove the main shaft snap ring and press the bearing from the main shaft.



1. Adapter

FIGURE 79—*Separate the Adapter From the Transmission Case.*



1. Snap Ring

FIGURE 80—*Remove the Large Snap Ring in the Bearing Adapter.*

TECHNICAL SERVICE LETTER REFERENCE

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TECHNICAL SERVICE LETTER REFERENCE

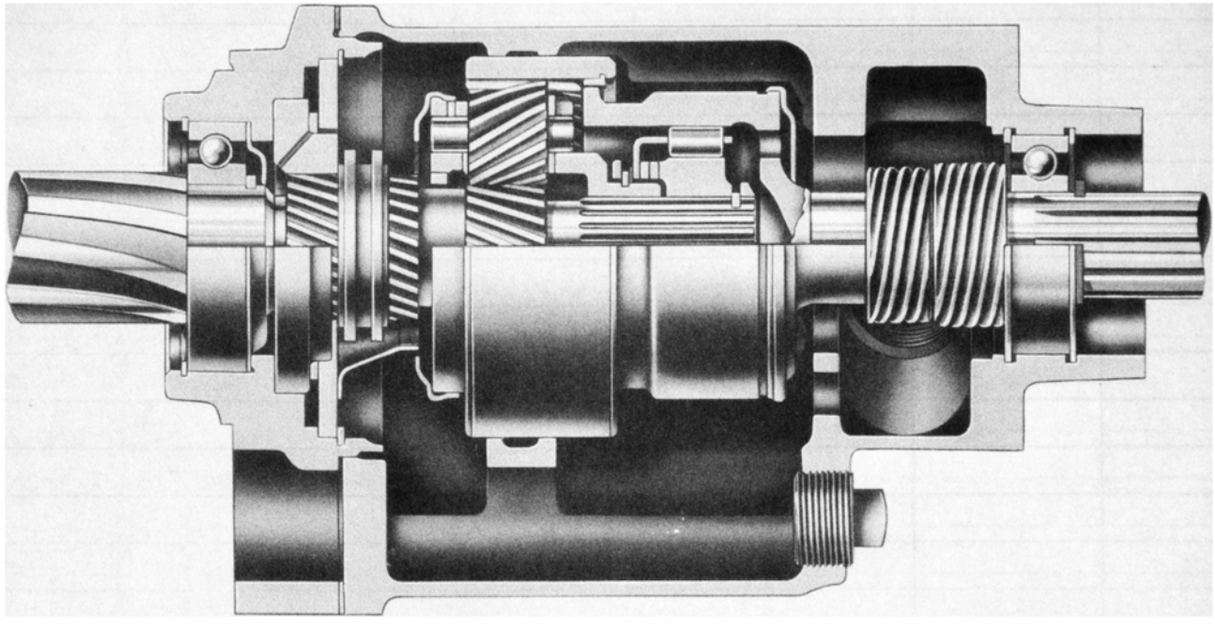
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OVERDRIVE SECTION

THE NASH OVERDRIVE—"AMBASSADOR", "STATESMAN", AND "RAMBLER" SERIES.



The Nash Overdrive—"Ambassador," "Statesman," and "Rambler" Series

OPERATION

The overdrive unit, when in operation above the governor cut-in speed, automatically reduces the engine to rear axle ratio approximately 30%.

When overdrive operation is desired, the control button is pushed to the forward position. The car speed is then increased to a point higher than the cut-in speed which is determined by the point setting of the overdrive governor.

As the governor points close, at approximately 25 miles per hour, the solenoid is energized. This allows the locking pawl to engage the sun gear hub and balk ring assembly, when the accelerator is momentarily released. When the accelerator is again depressed, the overdrive is in operation. When this takes place, free wheeling becomes inoperative, as free wheeling is possible only below the cut-in speed determined by the overdrive governor.

To lock out the overdrive, the control button must be pulled all the way out. This can be done either when the car is in motion or when it is parked.

Locking out the overdrive while the car is in motion can be done while the car is in the free wheeling stage. The accelerator is depressed so that the engine is driving the car, and the control button is pulled out without depressing the clutch; while still applying pressure to the control button, the accelerator should be momentarily released to complete the shift.

An alternate method permits pulling the control button back into conventional position during the time the accelerator pedal is *fully depressed* in the overtake position.

THE OVERDRIVE CONTROL UNITS

In order to service this control system, it is very important to understand just how it works. The following paragraphs explain the entire overdrive control system.

The Electrical Circuits

The electrical system (Figs. 1, 2, 3, and 4) consists of the three following circuits:

Governor circuit—Light line
Solenoid circuit—Heavy line
Kickdown circuit—Dotted line

Governor Circuit

The governor circuit starts from a terminal on the ignition switch to the terminal "IGN" on the overdrive relay. Then, passing through the relay

coil which magnetically controls the contact points "B" of the solenoid circuit, it continues from the "TH" terminal of the relay to the kickdown switch relay terminal "E".

Crossing the kickdown switch to the overdrive terminal "K", it passes thence to "F" and through the closed contacts of the overdrive shift switch to terminal "G" and to the governor "H" and its open contact points "A".

Solenoid Circuit

The solenoid circuit starts at the "B" terminal of the voltage regulator. It then proceeds to the battery terminal of the overdrive relay where it passes through a 30 ampere fuse, then to the open contact points "B".

The circuit is resumed at the solenoid terminal "SOL" of the relay and proceeds to terminal "4" of the solenoid where it divides into two coils, passing through the holding coil to the ground and through the solenoid coil and closed contacts "C" to the ground.

Kickdown Circuit

The kickdown circuit starts at the ignition coil positive terminal and proceeds to the coil terminal "J" on the kickdown switch. From the open contacts of the kickdown switch, it continues from terminal "L" to terminal "6" on the solenoid. Open contacts "D" are in the path between terminal "6" and the solenoid ground (Fig. 1).

The Circuits in Action

When the car attains a speed of approximately 25 miles per hour, the centrifugal action of the weights in the governor closes contacts "A", thus completing the circuit from the ignition switch to the ground.

The relay coil, being energized magnetically, closes the relay contacts "B" of the solenoid circuit.

The solenoid circuit, being completed, immediately energizes the actuating coil of the solenoid moving the pawl into the balk ring and lock plate.

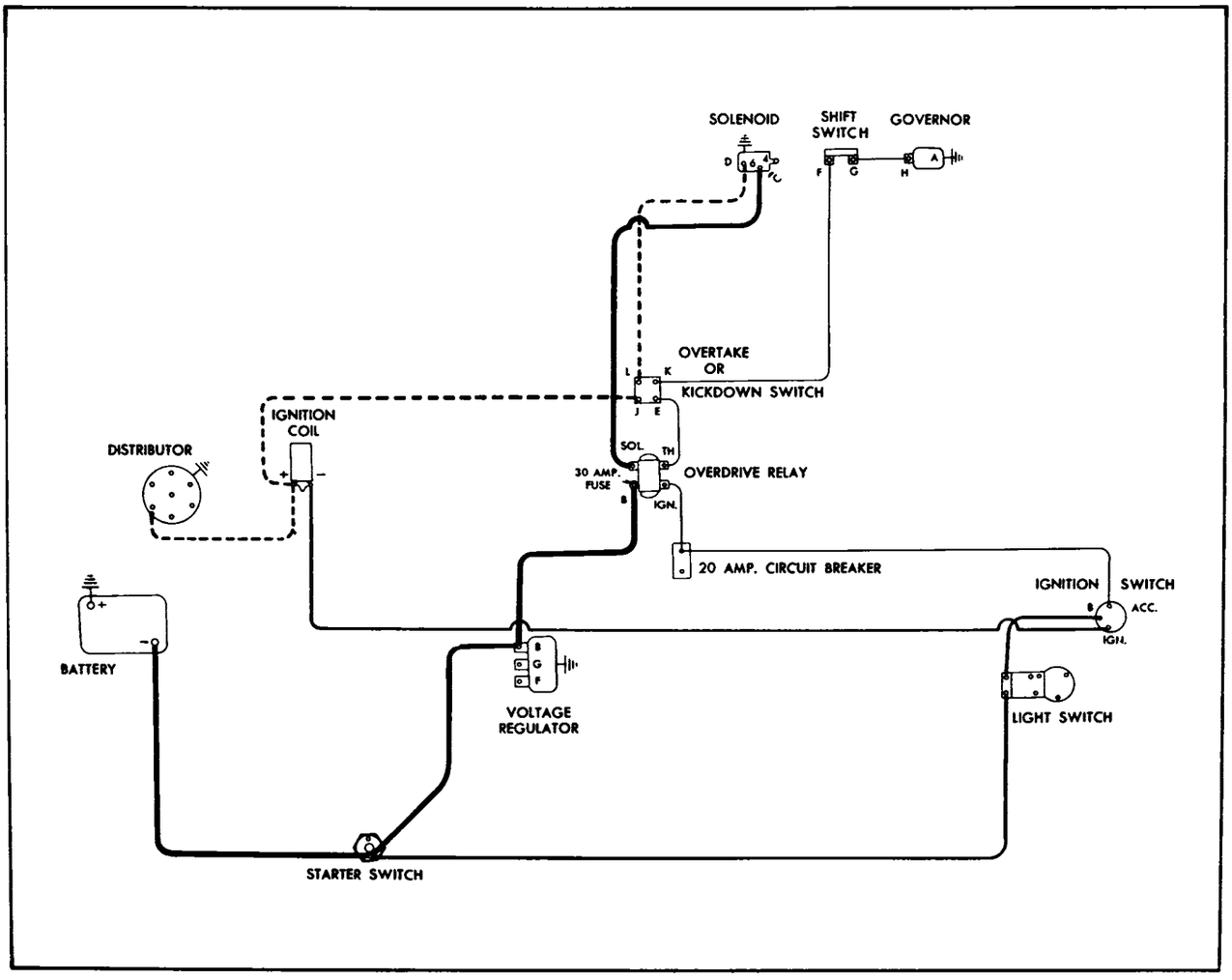


FIGURE 1—***The Governor Circuit (Light Line), The Solenoid Circuit (Heavy Line), and The Kickdown Circuit (Dotted Line), All Operate to Energize or De-energize the Solenoid.***

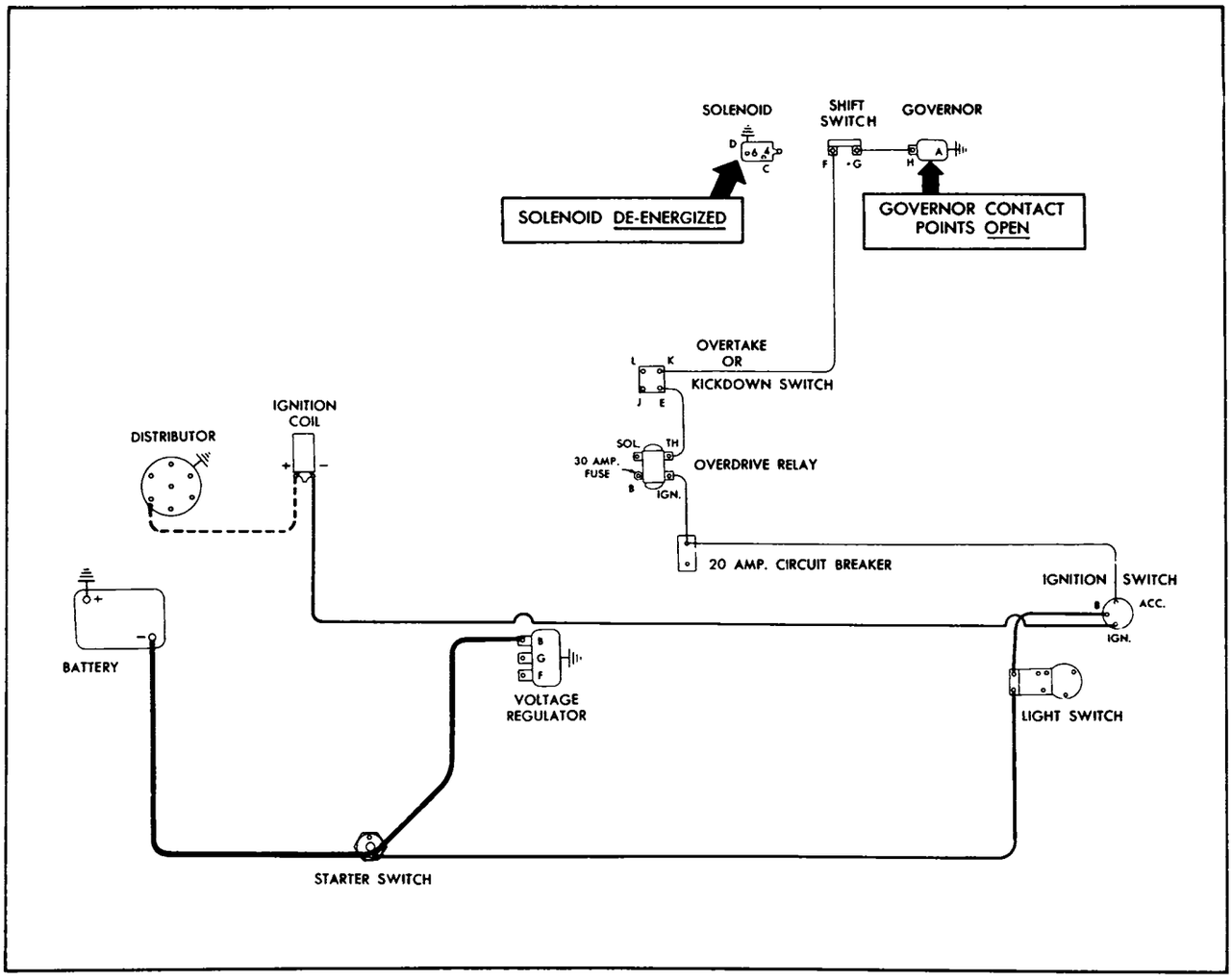


FIGURE 2—*At Less Than 25 Miles Per Hour the Governor Switch Keeps the Circuit Open and the Solenoid Pawl Remains Disengaged.*

As soon as the solenoid plunger has been permitted to enter the lock plate, the contacts "C" in the solenoid actuating circuit are opened, permitting a decreased flow of current through the holding coil to retain the plunger in position during the time when the overdrive is in operation.

The inward movement of the solenoid plunger, in addition to operating the contact "C" in the solenoid actuating circuit, also closes contact "D" in the kickdown circuit through the release of the spring lever on the outer end of the solenoid. The circuits are now in normal condition for continuing the overdrive operation.

In order to understand the overdrive control system, the first thing to remember is that any time there is an open switch in a circuit that entire circuit is open and inactive. When all four switches in the governor circuit are closed, the relay coil is energized closing the points "B". This completes the solenoid circuit and energizes the solenoid, which, through the locking pawl, locks the sun gear and places the overdrive in cruising gear. Also, any time any one of the four governor circuit switches are open, the relay coil is de-energized, the points open, and the solenoid circuit is broken.

At Speeds Below 25 Miles Per Hour

With the cruising gear control forward at speeds below 25 miles per hour, every switch in the governor circuit is closed except the governor switch. But this one open switch is enough to keep the entire governor circuit and the solenoid circuit open, and the solenoid remains de-energized (Fig. 2).

At Speeds Above 25 Miles Per Hour

As the speed of the car passes 25 miles per hour, the governor points automatically close. This completes the governor circuit, energizes the relay, and closes the relay points "B", thus energizing the solenoid.

Then, with a momentary release of the accelerator pedal, engine torque is released just long enough for the solenoid pawl to move off the step

of the balk ring and engage the notch of the lock plate locking the sun gear. This places the car in cruising gear (Fig. 3).

The Kickdown Switch (and Overtake Position)

With the car in cruising gear at speeds above 25 miles per hour, depressing the foot accelerator all the way to the floor, places the overdrive in overtake position (Fig. 4).

With the accelerator pedal in the wide open position, it contacts the kickdown switch opening the points "E" and "K" in the kickdown switch and closes points "J" and "L". This at the same time breaks the governor circuit and completes the kickdown circuit. The break in the governor circuit de-energizes the solenoid. The closing of the kickdown circuit momentarily "shorts out" the distributor (for approximately two crankshaft revolutions) releasing engine torque just long enough for the solenoid pawl to disengage. The instant the solenoid disengages, the solenoid points "D" automatically open, restoring the distributor circuit. The car then remains in direct gear as long as the engine is kept under a pulling load.

The Overdrive Shift Switch

The cruising gear control button on the instrument panel is connected to the shift lever and rod that operates the shift switch. When this button is all the way forward, the shift switch is closed and the overdrive will operate as detailed in the foregoing paragraphs. Pulling this button to the rear or conventional position, however, moves the shift rod in the overdrive so as to open the shift switch (breaking the governor circuit). This also shifts the sun gear into the locked-out position. The overdrive in this position is in direct gear at all times.

Placing the gear shift lever in the reverse position does the same thing as pulling out the cruising gear control button. When the transmission is placed in reverse, the cam on the shifter quadrant moves the shifter rod to the rear, shifting the sun

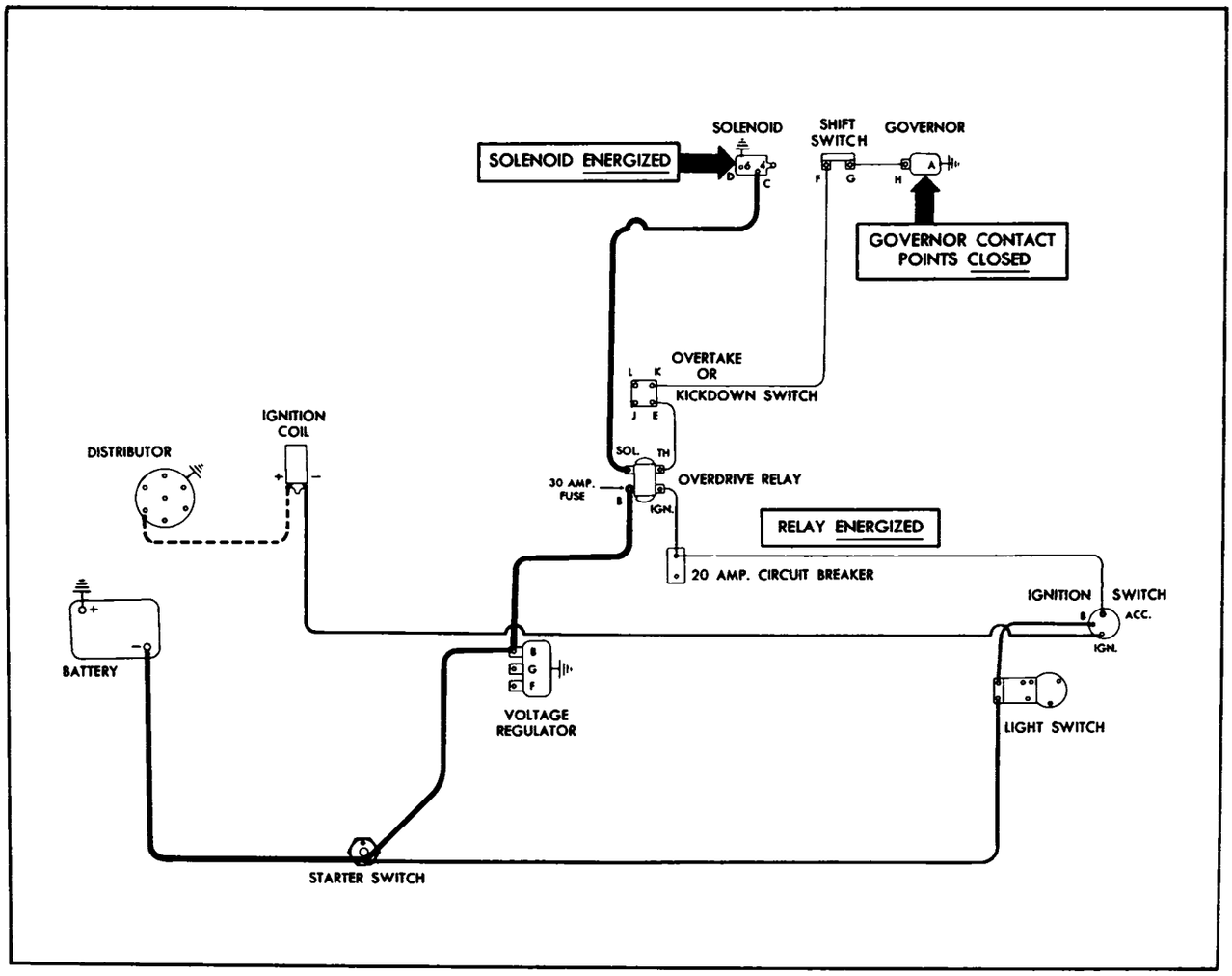


FIGURE 3—***Above 25 Miles Per Hour the Governor Points Automatically Close, Thus Closing the Governor Circuit and the Relay, Which Energizes the Solenoid.***

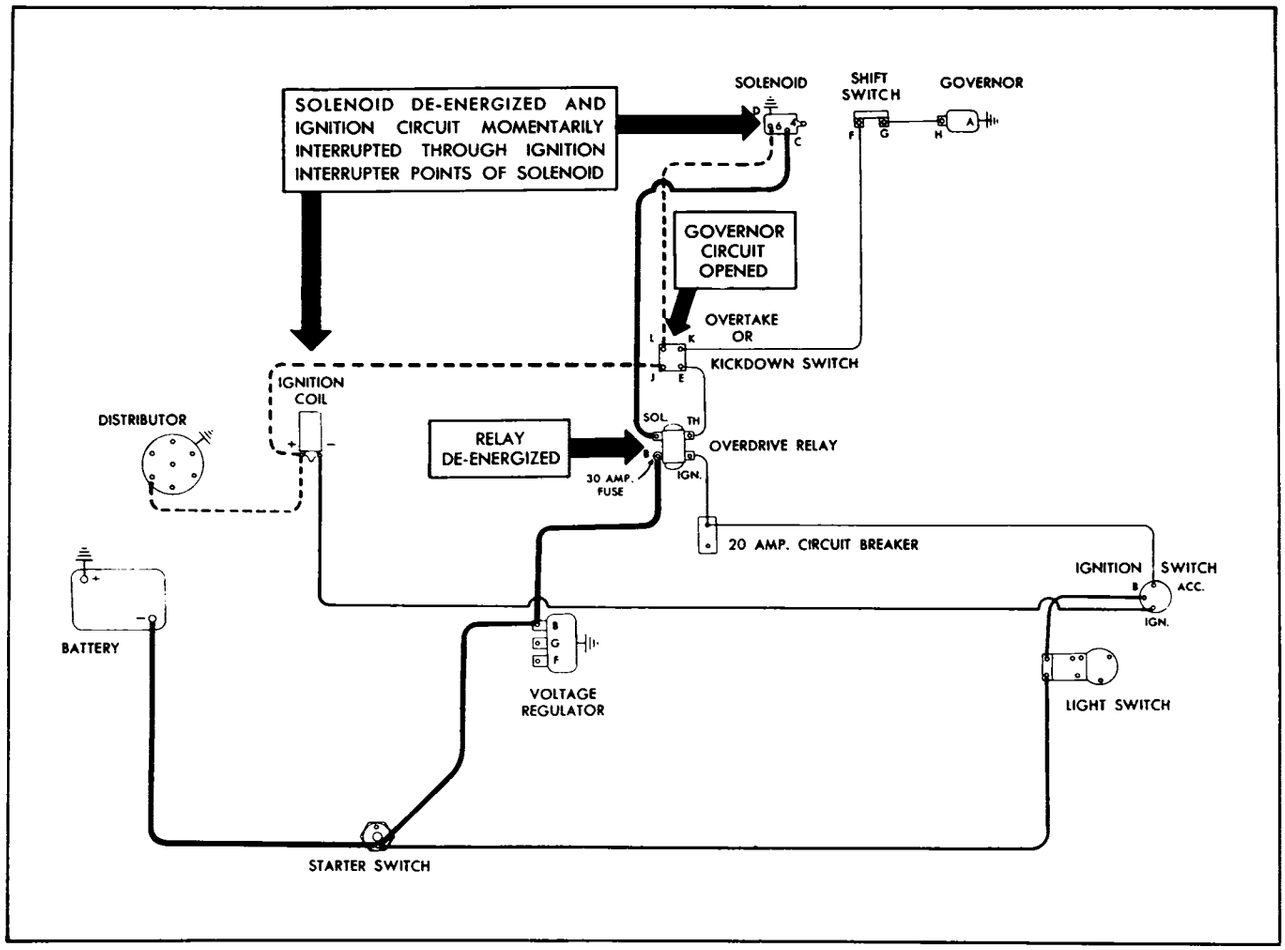


FIGURE 4—*With the Kickdown Switch Open, the Governor Circuit is Broken and the Solenoid De-energized. Also, the Distributor is Shorted Out to Release Engine Torque.*

gear, locking the overdrive in direct gear, and opening the shift switch.

DIAGNOSING OVERDRIVE TROUBLES

Since overdrive troubles may originate not only in the mechanical operation of the unit but also in the electrical circuit which controls that unit, the service man should always check the control system before disassembling the overdrive.

If the trouble is not found after a thorough inspection of the control system, then the transmission and overdrive should be removed for examination.

Unsatisfactory Overdrive Operation. Look for:

1. Burnt relay fuse in solenoid circuit.
2. Loose terminals on any of the connecting wires.
3. Incorrect terminal locations of connecting wires.
4. Circuits grounded by water, dirt, or deformation.
5. Defective solenoid points. (Replace solenoid.)
6. Dirty or sticking relay contacts.
7. Insufficient travel or unsatisfactory contacts in the kickdown switch. (Adjust or replace.)
8. Stuck open or dirty contacts in the overdrive shift switch. (Replace.)
9. Excessive end play in the governor shaft. (Adjust.)
10. Improper adjustment of governor control springs. (Replace governor.)
11. Burnt contact points. (Replace governor.)
12. Damage to cap and contacts. (Replace governor.)
13. Absence of rubber cover to exclude water and dirt. (Install cover.)
14. Insufficient travel of shift rod. (Adjust control cable to operating lever.)

CHECKING INOPERATIVE OVERDRIVE

Mechanical Checks

1. Determine if the overdrive control button is pushed forward to the limit of travel.
2. Check to insure that the overdrive cable is adjusted to move the overdrive lever firmly

against the stop on the overdrive housing in the engaged position.

Electrical Checks

With the ignition switch on, and the overdrive cable pushed forward, use a test wire or a 6-volt test light.

1. Check the 30 ampere fuse in the overdrive relay for live circuits and clean contacts.
2. Connect directly from the hot terminal on the circuit breaker to the terminal "SOL" on the overdrive relay mounted on the front of the cowl. This will supply current to the solenoid which should operate. If it does not, check for a possible defective connecting wire or connection at the solenoid terminal before condemning the solenoid.
3. Ground the relay terminal "TH". If the relay is functioning properly, the points of the relay will close and the solenoid will operate.
4. Ground the terminal "E" (see diagram) on the kickdown switch. If all circuits are correct to this point, the solenoid should operate.
5. With the kickdown switch terminal "K" grounded (see diagram), push the plunger in. This breaks the circuit and the solenoid should release.

If the solenoid operates in the above tests, all circuits up to this point are correct and further investigation must be conducted underneath the car.

6. With the test wire, ground terminal "F" (see diagram) on the overdrive shift switch. The solenoid should operate as the connection is made. Then ground terminal "G" on the overdrive shift switch, and again the solenoid should operate. If it does not, the switch is at fault, the control cable is misadjusted, or the shift rod is stuck in the case. The latter cause is indicated by lack of spring load on the shift lever.
7. Ground terminal "H" on the governor. The solenoid should operate.
8. Governor Operation Inspection: Suspend the axle and operate the engine at low speed in high gear. Apply a test lamp across the governor contacts from the live terminal "H" to the ground strap. The test lamp should light. Now increase engine speed. The governor cut-in speed will be indicated when the light goes out.

Summary

By following the above procedure in the proper sequence, the defective portion of the electrical circuit can be readily located. If all the preceding items are functioning correctly, the trouble may lie in the solenoid itself, such as burned points, or the connecting wires may be grounded to the case.

The kickdown switch should be carefully inspected to see that none of its four terminals are touching each other. If the terminals "E" and "J" make contact, the grounded circuit will supply current to the relay, operating the solenoid without the possibility of disengagement. This is usually the case when the car will not freewheel or properly shift into reverse.

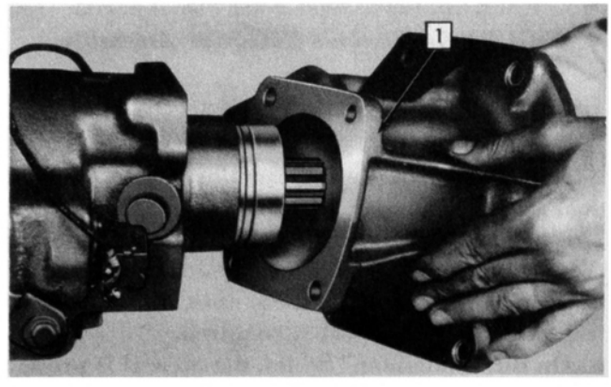
A rubber boot has been provided to exclude water and dirt from the governor. Moisture or an accumulation of foreign matter may ground the live terminal on the governor and cause the solenoid to operate as soon as the ignition is turned on.

If the mechanical and operating checks do not reveal the difficulty, internal trouble should be suspected and the transmission and overdrive removed for examination.

DISASSEMBLING THE OVERDRIVE

NOTE: *Due to the similarity of the "Ambassador," "Statesman," and "Rambler" Series Overdrive Units in appearance and operation, most of the illustrations shown refer to the "Ambassador" Series.*

The transmission and overdrive is removed from the car as a unit. However, it is not necessary to disassemble the transmission in order to overhaul the overdrive unless the transmission main shaft, the bearing in the adapter, or other transmission parts require replacement.



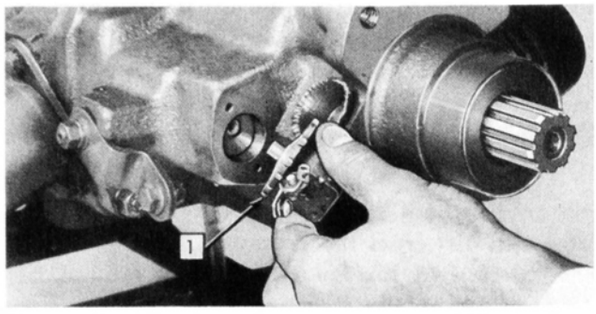
1. Torque Tube Adapter

FIGURE 5—*Remove the Torque Tube Adapter ("Ambassador" and "Statesman" Series Only).*

Removing the Torque Tube Adapter and Electrical Controls

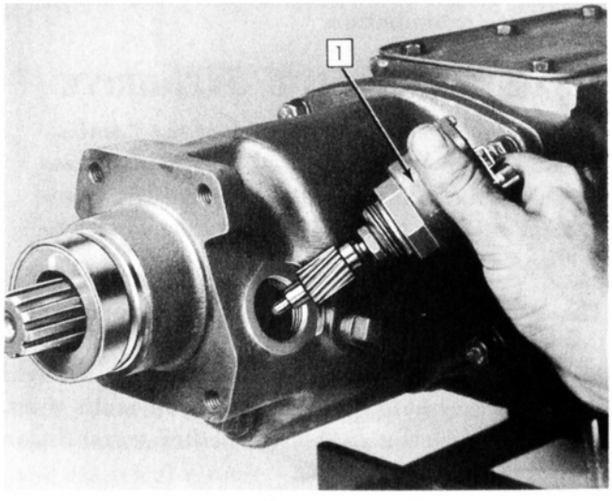
With the transmission and overdrive assembly drained of its lubricant and set up in a transmission stand, remove the torque tube adapter ("Ambassador" and "Statesman" Series only) (Fig. 5).

Then remove the shift switch from the rear of the overdrive and the governor and drive unit assembly from the case (Figs. 6 and 7).



1. Shift Switch

FIGURE 6—*Remove the Shift Switch.*



1. Governor Assembly

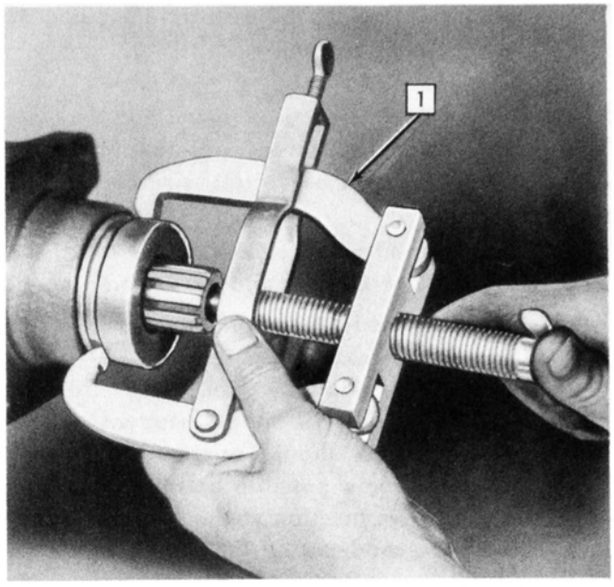
FIGURE 7—*Remove Governor Assembly.*

Removing the Overdrive Rear Oil Seal and Adapter

The "Ambassador" and "Rambler" Series rear oil seal is pressed into an oil seal adapter. The adapter can be removed from the overdrive case by using Tool J-2497 (Fig. 8). Tool J-2619 and J-4830 is used to remove the oil seal in those cases where only the replacement of the seal is required.

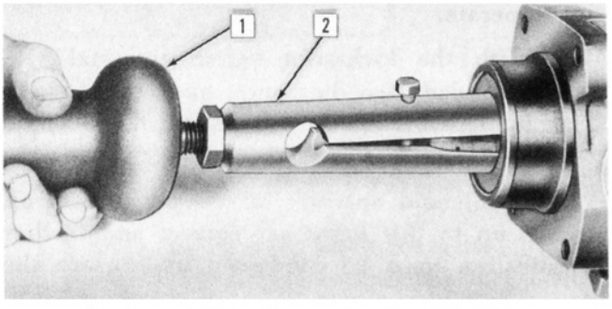
On the "Statesman" Series, the oil seal is pressed into the case and can be removed by using Tool J-2619 and J-4830 (Fig. 9).

After removing the oil seal and/or adapter, remove the main shaft snap ring (Fig. 10).



1. Rear Oil Seal Removing Tool J-2497

FIGURE 8—*Use Tool J-2497 to Remove the Rear Oil Seal Adapter.*



1. Rear Oil Seal Removing Tool J-2619
2. Rear Oil Seal Removing Tool J-4830

FIGURE 9—*Use Tool J-2619 and J-4830 to Remove the Rear Oil Seal ("Statesman" Series).*

Disengaging the Shift Shaft

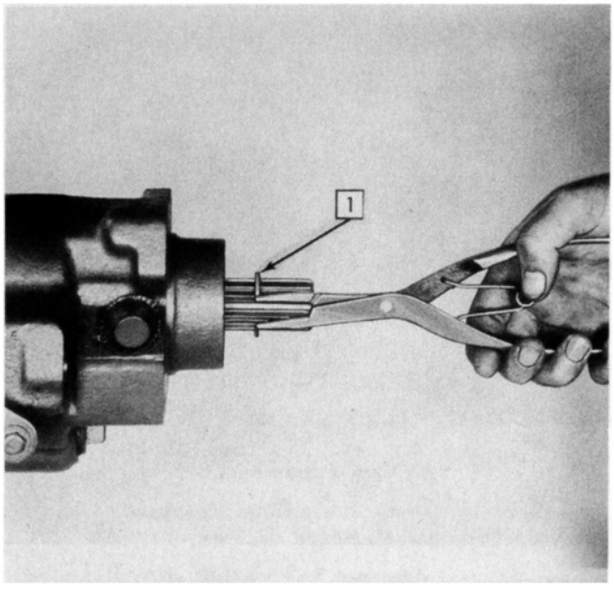
Drive out the lock pin that holds the overdrive shift shaft in the overdrive case (Fig. 11).

After the lock pin has been removed, pull the shaft toward the outside of the case; this disengages the shift shaft from the shift rail.

Removing the Overdrive Case

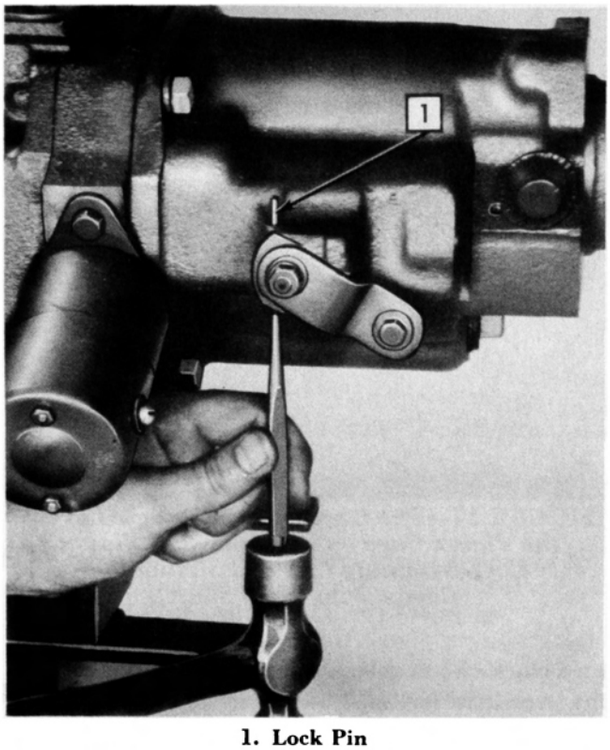
Remove the cap screws that hold the overdrive case to the transmission. Then separate the overdrive from the transmission at the rear of the overdrive bearing adapter.

CAUTION: *Do not separate the overdrive bearing adapter from the transmission case. As soon as the overdrive case has been*



1. Snap Ring

FIGURE 10—*Remove Main Shaft Snap Ring Using Snap Ring Pliers.*



1. Lock Pin

FIGURE 11—*Drive Out Tapered Lock Pin.*

pulled far enough away from the adapter to provide clearance, insert a holding bolt through the adapter and bolt it to the transmission.

As you remove the overdrive case, keep tapping the end of the main shaft with a soft hammer. This will keep the shaft from coming out, and will prevent the free wheeling rollers from dropping into the case. The speedometer and governor drive gears will remain on the main shaft (Fig. 12).

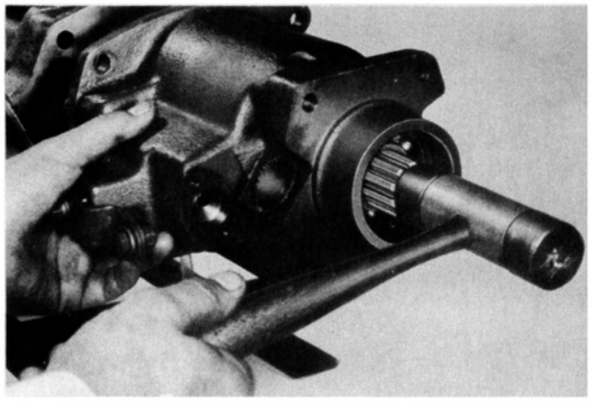
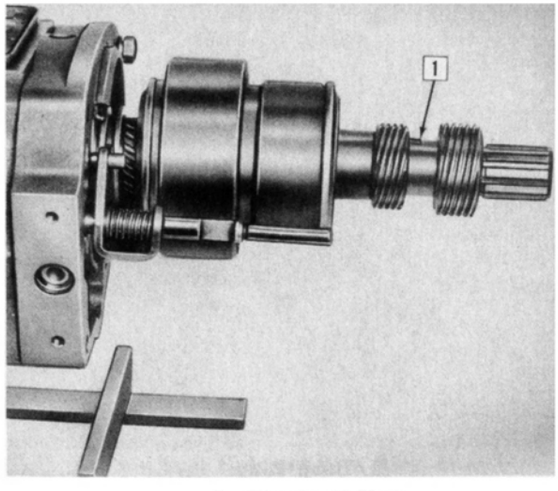


FIGURE 12—*To Keep the Free Wheeling Rollers From Falling Out, Tap the Main Shaft With a Soft Hammer as You Remove the Overdrive Case.*

Both the speedometer and governor drive gears are retained by a Woodruff key and can easily be slid off the main shaft (Fig. 13).



1. Woodruff Key

FIGURE 13—*Both Governor and Speedometer Drive Gears are Retained on the Shaft by a Woodruff Key.*

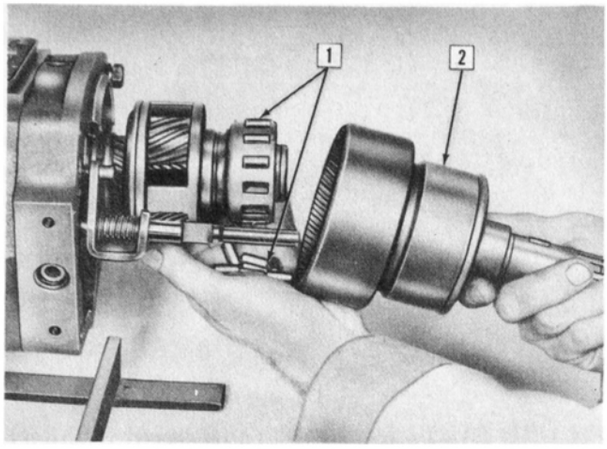
Removing the Main Shaft and Ring Gear

Remove the overdrive main shaft and ring gear. As the main shaft is being removed, the rollers will drop out, so keep one hand underneath to catch them (Fig. 14).

To remove the ring gear from the main shaft, remove the large ring gear snap ring. The gear will then separate from the main shaft (Fig. 15).

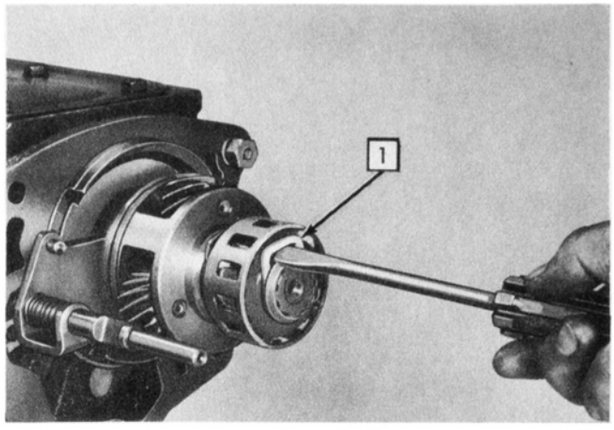
Removing the Cam and Pinion Cage

To remove the cam and pinion cage from the transmission main shaft, remove the cam retaining clip with a screw driver (Fig. 16).



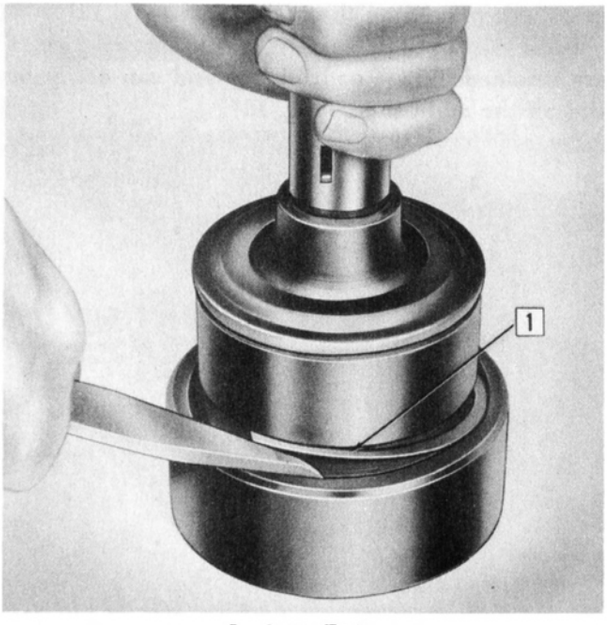
1. Rollers
2. Main Shaft

FIGURE 14—*Remove the Main Shaft and Rollers.*



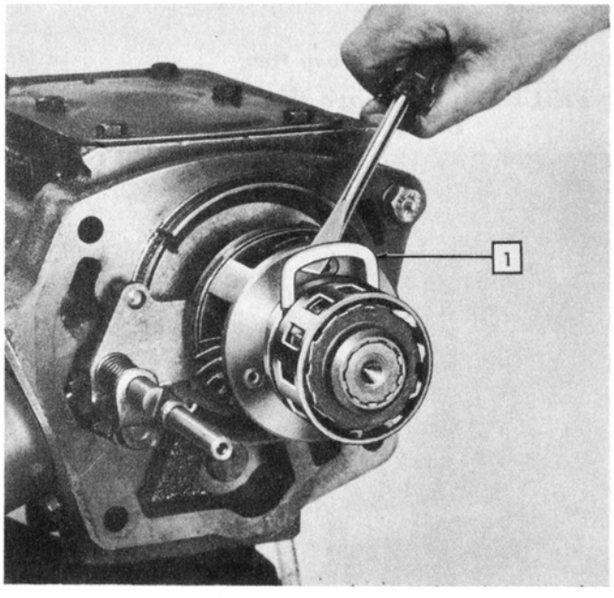
1. Cam Retaining Clip

FIGURE 16—*Remove Cam Retaining Clip With Screw Driver.*



1. Snap Ring

FIGURE 15—*Remove the Snap Ring to Separate the Ring Gear From the Main Shaft.*



1. Pinion Cage Retaining Clip

FIGURE 17—*The Cam can be Separated From the Pinion Cage by Removing the Pinion Cage Retaining Clip and Sliding the Cage off the Main Shaft.*

The cam can then be separated from the pinion cage by removing the pinion cage retaining clip and separating the two units (Fig. 17).

Removing the Sun Gear and Shifter Rod Assembly

Remove the overdrive shifter rod and sun gear and collar from the main shaft as a unit. When the sun gear is free of the sun gear hub, the shifter rod assembly can be separated from the sun gear shifting collar (Fig. 18).

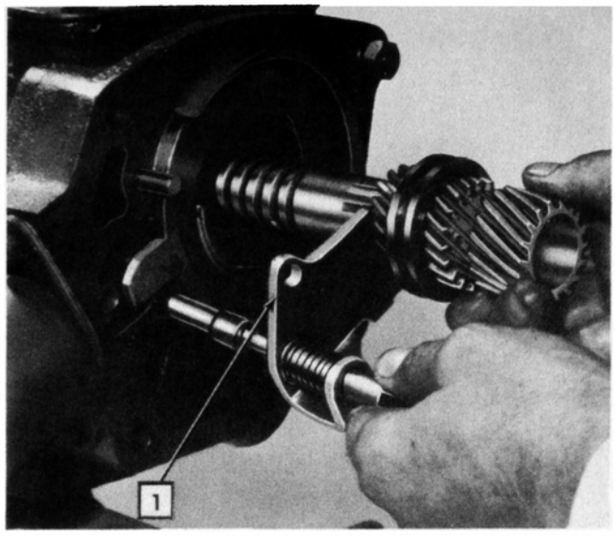
Removing the Solenoid

Remove the two cap screws that hold the solenoid to the bearing adapter. Turn the unit one-quarter turn clockwise to release the solenoid plunger from the overdrive locking pawl. The solenoid can then be removed (Fig. 19).

Removing the Cover Plate, Sun Gear Hub and Balk Ring Assembly, and Locking Pawl

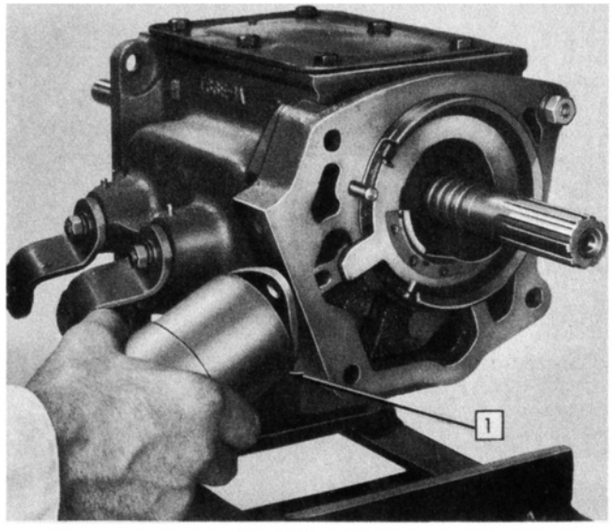
Using a pair of pliers, remove the large snap ring that holds the sun gear cover plate, hub and overdrive balk ring in place (Fig. 20).

Remove the cover plate and trough assembly and the sun gear hub assembly. Then the overdrive locking pawl can be lifted out (Fig. 21).



1. Shifter Rod Assembly

FIGURE 18—*The Overdrive Shifter Rod Assembly and the Sun Gear and Collar can be Removed Together.*



1. Solenoid

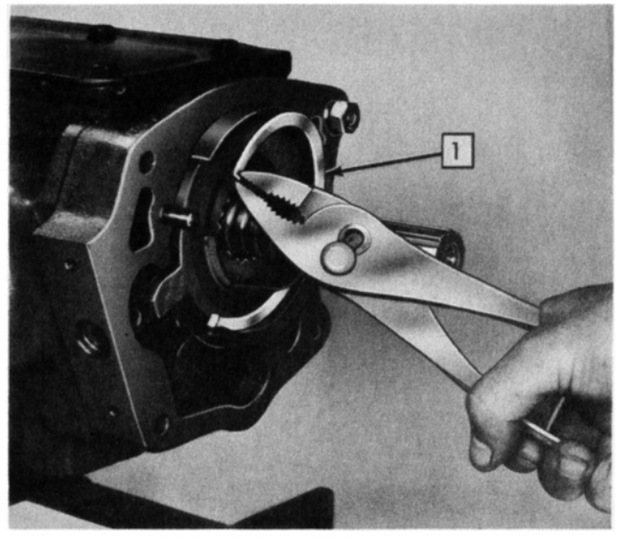
FIGURE 19—*Remove the Overdrive Solenoid by Taking out the Cap Screws, Turning the Unit One-Quarter Turn Clockwise, and Pulling it out.*

Removing the Lockout Spring and Shift Shaft

The shifter shaft can easily be removed from the inside of the overdrive case. Remove the retracting spring, shifter lever, and shaft. Discard the oil seal. A new one will be used on reassembly.

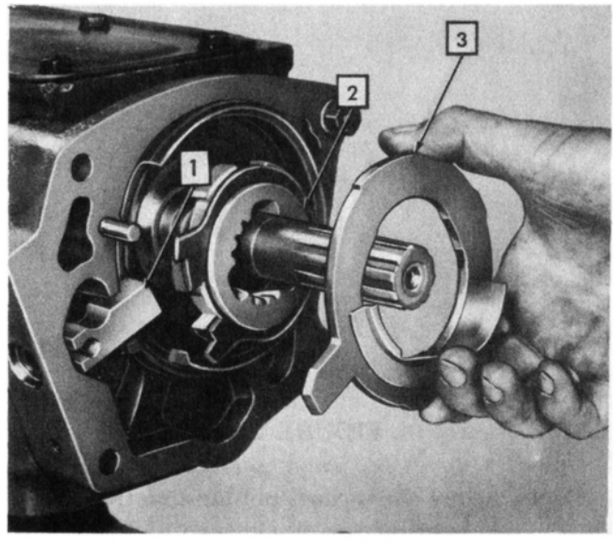
Removing the Main Shaft Bearing

Remove the rear snap ring, and tap the bearing out through the rear of the overdrive case. The inner snap ring can then be removed. This completes the disassembly of the overdrive unit. However, if the transmission main (spline) shaft or



1. Snap Ring

FIGURE 20—*Remove Cover Plate Snap Ring.*



1. Locking Pawl
2. Sun Gear Hub and Balk Ring Assembly
3. Cover Plate

FIGURE 21—*Removing the Cover Plate Allows the Sun Gear Hub Assembly and the Locking Pawl to be Removed.*

the bearing adapter must be removed, remove the bearing adapter, the main shaft, and transmission gears as an assembly. Follow the procedure as outlined in the transmission section.

INSPECTING PARTS

There are no internal adjustments to be made in the overdrive. However, for assurance of good operation, every part should be inspected carefully to be sure it is in good condition. If all parts are up to standard and correctly assembled, the unit will operate properly.

Pinion Cage and Gears

Examine the pinion gears in the planetary pinion cage for worn, cracked, or chipped teeth. Rotate

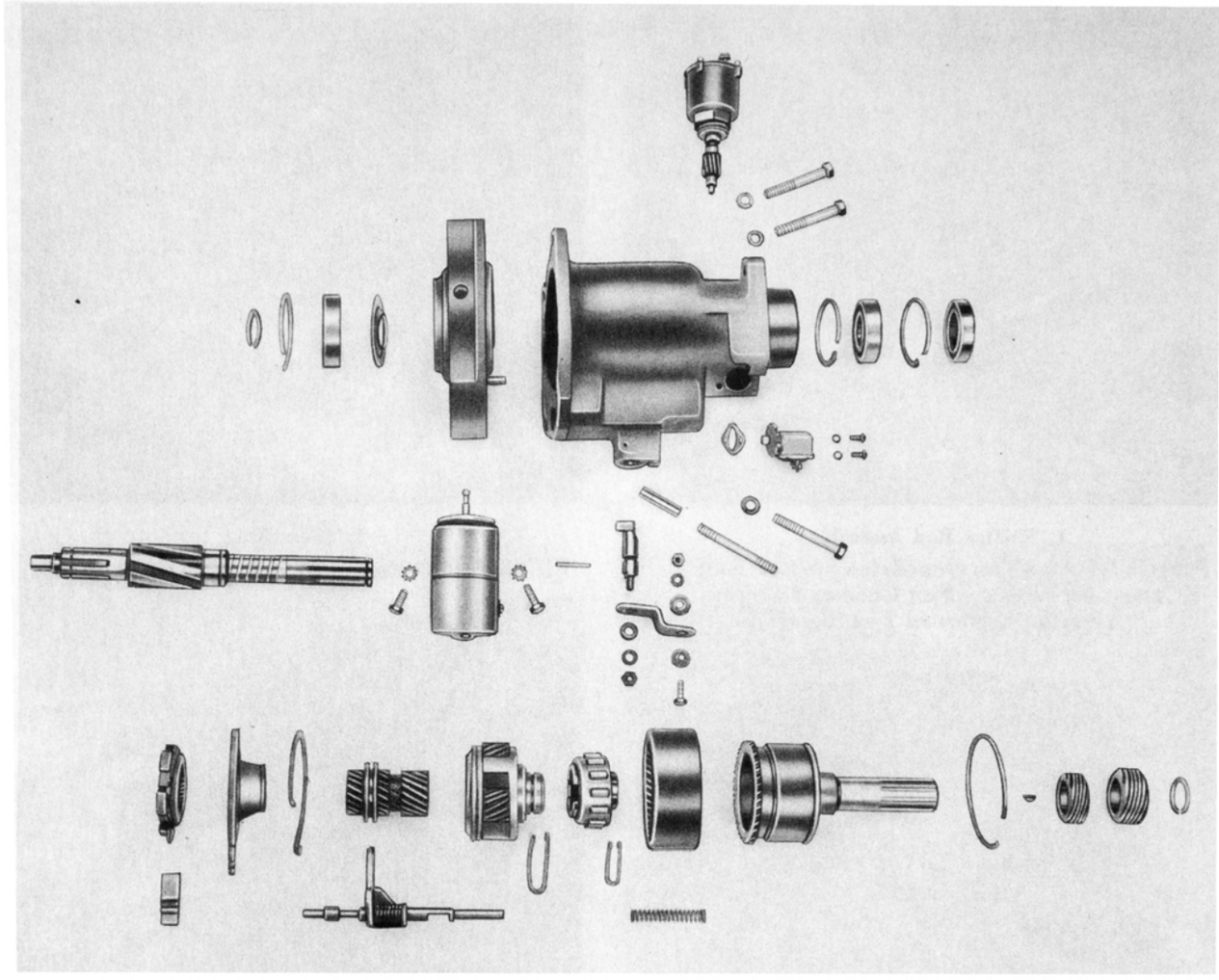


FIGURE 22—*Overdrive Assembly ("Statesman" Series Shown).*

each gear to see that it does not bind on the pinion shaft. Then examine the oil slinger which is a part of the pinion cage. This slinger supplies lubrication to the pinion gears. If it is bent or otherwise damaged, it will not operate efficiently.

Sun Gear Hub and Balk Ring

Test the fit and tension of the balk ring on the sun gear hub. When pressure is applied in a direction that tends to close the ring, it should bind against the hub so that it will not return. When pressure is applied on the end of the ring in a direction that tends to spread or open the ring, it should slide around the hub (Fig. 23).

A spring scale may be used to measure balk ring tension—3½ to 5½ pounds pull required (Fig. 24).

Free Wheeling Rollers, Housing, and Cam

Examine each of the free wheeling rollers and the overdrive main shaft housing in which they turn for wear, scoring, rough surfaces, or any indications that the rollers may be slipping in the housing.

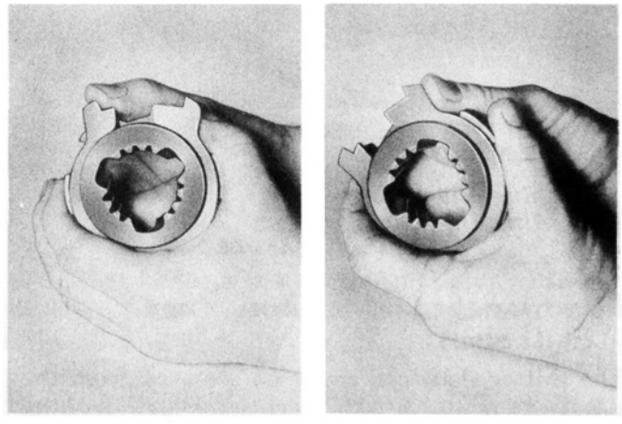


FIGURE 23—*Testing Balk Ring Tension. Left: When You Push One End Toward the Other, the Ring Should Grab and Hold. Right: When You Push One End of the Ring Away From the Other, the Ring Should Slide Around the Hub.*

Inspect the roller cams on the free wheel hub for wear or grooving (Fig. 25).

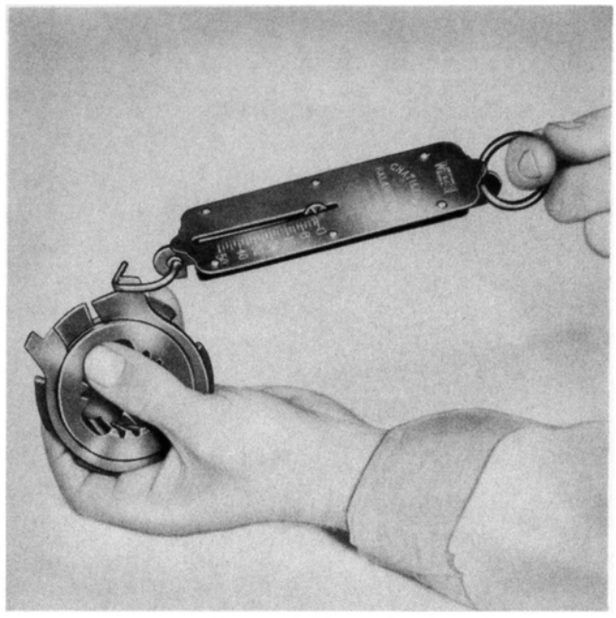


FIGURE 24—*Measuring Balk Ring Tension With Spring Scale—3½# to 5½# Pull.*

Test the action of the two cam retaining springs. These springs are designed to twist the cam in a clockwise direction, thus holding the rollers up on the cam. If this spring action is slow or retarded,

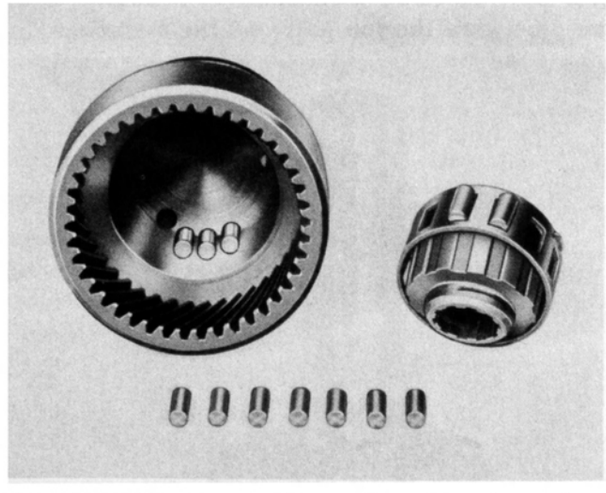


FIGURE 25—*Inspection of Overdrive Parts is Important. The Free Wheeling Rollers Will Slip if These Parts are Worn.*

it will result in a loud thump whenever the free wheeling unit engages on acceleration. To test it, grasp the cam roller retainer and turn it counter-clockwise. Then release it suddenly. If the retainer springs quickly back in a clockwise direction, the springs are all right. If the action is sluggish, replace the springs (Fig. 26).

REASSEMBLING THE OVERDRIVE

When all parts have been carefully inspected, the unit is ready for reassembly. As each part is

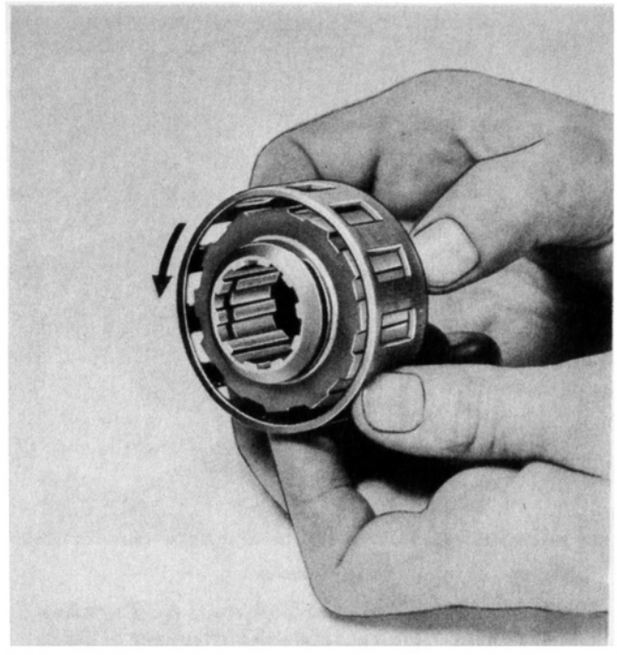


FIGURE 26—*When You Twist the Cam Roller Retainer Counter-Clockwise, the Two Springs Should Snap it Back Quickly.*

assembled, be sure it is absolutely clean and lubricated with light engine oil. Always use new gaskets, oil seals, and snap rings in reassembly.

Reinstalling the Hub and Balk Ring, Locking Pawl, and Cover Plate

Install the hub and balk ring assembly with the chamfered side of the ring against the sun gear hub.

Install the locking pawl, positioning the pawl and balk ring in the "locked out" position, with the pawl on the step of the ring for correct installation of the solenoid.

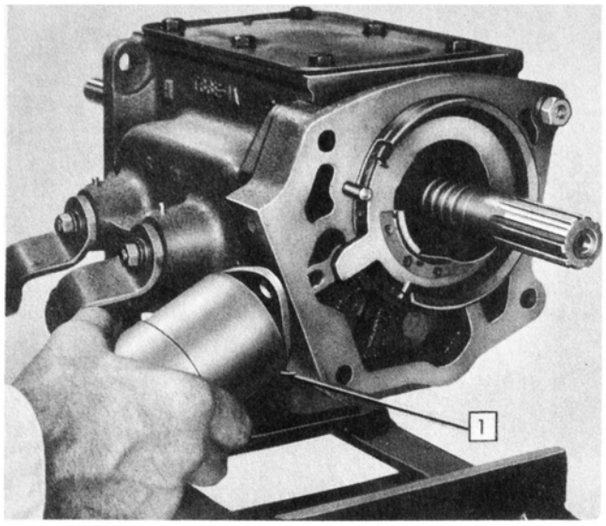
Install the cover plate and trough in position and lock it in place with the large snap ring.

Reinstalling the Solenoid

Insert the solenoid plunger in the opening in the bearing adapter and engage it with the notch in the locking pawl. Turn the solenoid one-quarter turn counter-clockwise to lock the pawl and plunger together. Pull the solenoid to be sure the plunger is locked with the pawl. Then install the two cap screws loosely (Fig. 27).

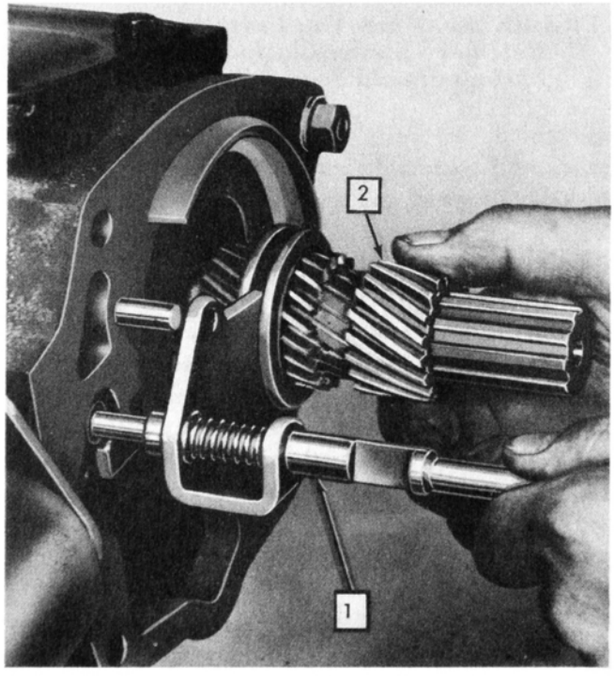
Reinstalling the Sun Gear and Shifter Rod Assembly

Install the fork of the shifter rod in the sun gear shift collar. Then hold them together as you slide the sun gear onto the main (spline) shaft and the shifter rod into the opening in the bearing adapter (Fig. 28).



1. Solenoid

FIGURE 27—*Install the Solenoid by Turning it Counter-Clockwise so the Plunger Will Lock with the Pawl.*



1. Shifter Rod
2. Sun Gear

FIGURE 28—*The Shifter Rod and Fork Assembly is Installed With the Sun Gear and Collar.*

Reinstalling the Pinion Cage and Cam

Install the pinion cage assembly on the main (spline) shaft, being careful not to distort the oil slinger. Then slide the free wheeling cam assembly onto the shaft, line up the slots in the pinion cage with the slots in the free wheeling cam, and install the pinion cage retaining clip (Fig. 29). Install the free wheeling cam retaining clip.

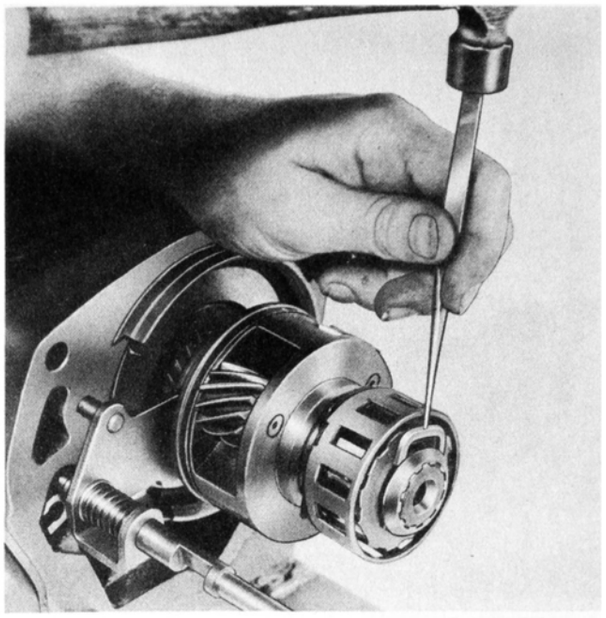


FIGURE 29—*With the Free Wheeling Cam and Pinion Cage on the Main (Spline) Shaft, Lock Them in Place With the Pinion Cage Retaining Clip and the Free Wheeling Cam Retaining Clip.*

After installing the retaining clips, shift the sun gear into and out of engagement to insure clearance between the sun gear and the oil trough.



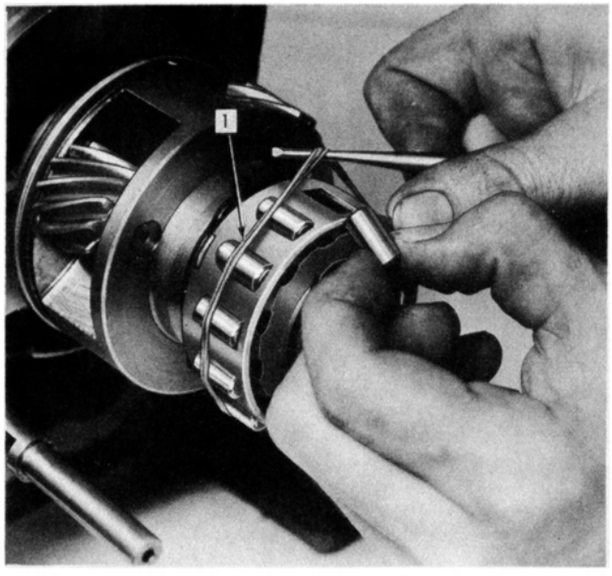
FIGURE 30—*Install a Snap Ring to Hold the Ring Gear on the Main Shaft.*

Reinstalling the Ring Gear and Main Shaft

Replace the ring gear on the overdrive main shaft and lock it in place with a snap ring (Fig. 30).

The Free Wheeling Rollers

Replace the free wheeling rollers in the free wheeling cam retainer. A small rubber band placed around the rollers will help to keep the rollers from dropping out while the main shaft and ring gear is being installed (Fig. 31).



1. Rubber Band

FIGURE 31—*A Rubber Band Serves to Hold the Free Wheeling Rollers in Position Until the Ring Gear and Main Shaft can be Installed.*

Now rotate the cage and roller assembly counterclockwise so that the rollers will be at the bottom of the cams. This will permit the installation of the overdrive main shaft and ring gear assembly (Fig. 32).

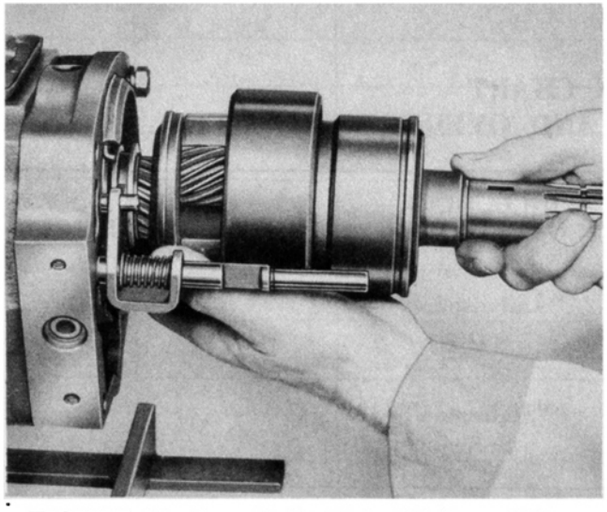


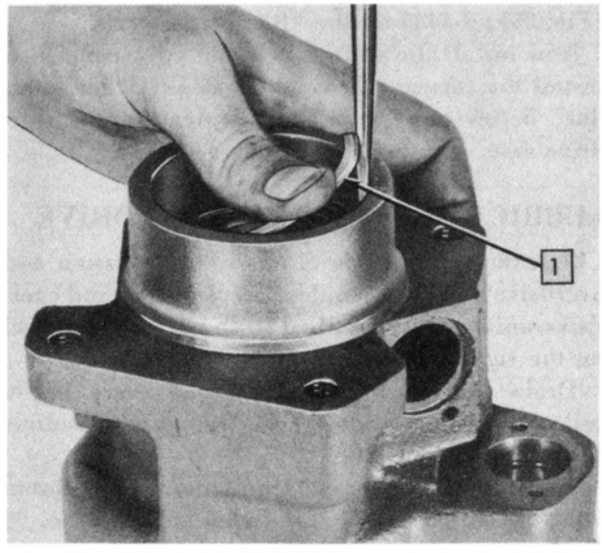
FIGURE 32—*Install the Main Shaft and Ring Gear on the Pinion Cage and Free Wheeling Cam.*

The Speedometer and Governor Drive Gears

Insert the Woodruff key into the main shaft. Then install the governor and speedometer drive gears. The governor drive gear, which is smaller in diameter, is installed against the shoulder on the main shaft.

Reinstalling the Main Shaft Bearing in the Case

Install the bearing inner snap ring in the overdrive case. Press the bearing in from the rear of the case until it seats against this ring. Then install the bearing outer snap ring (Fig. 33).



1. Snap Ring

FIGURE 33—*Install a Snap Ring on Each Side of the Overdrive Rear Bearing.*

Reinstalling the Shift Shaft and Overdrive Case

Install the shift shaft oil seal, shift shaft, shifting lever, and the shifter rod spring in the overdrive case. Then remove the bolt holding the bearing adapter to the transmission case, and work the overdrive case onto the overdrive assembly. Using a long punch through the shift switch opening, guide the shifter rod through the spring and case.

Install the stud spacer to maintain case alignment and replace the cap screws. Tighten securely.

Push the shift shaft into the case so that the operating cam will engage with the slot in the shift rod. Then install the lock pin to hold the shaft in position.

NOTE: *Inspect the operation of the shift lever as follows: With the lever against the machined stop on the boss of the case, a slight free movement with no tension should*

be evident. Excessive movement with no tension indicates that the shift rod is binding in the case.

Finally, tighten the solenoid cap screws.

Completing the Reassembly of the Overdrive

Install the main shaft snap ring. This snap ring is supplied in .087", .090", .093", .096", and .100" thicknesses. Use the largest size possible to prevent end play (Fig. 34).

Then install the oil seal adapter and oil seal (the "Statesman" Series oil seal is installed in the overdrive case). Use tool J-1556 oil seal installing tool for the "Ambassador" and "Statesman" Series (Fig. 35); J-4485 on the "Rambler" Series.

Now install the shift switch and governor. Then install the torque tube adapter gasket ("Ambassador" Series only) and the adapter on the overdrive case.

LUBRICATION OF THE OVERDRIVE

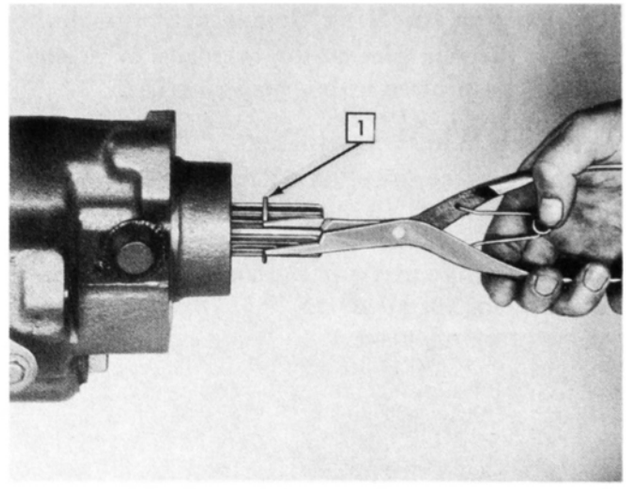
Check the lubricant level of the transmission and overdrive every 1,000 miles. Transmission and overdrive units should be filled to the drain plug level on the right side of both units.

Drain and clean twice a year, or every 10,000 miles, using only flushing oils. Do not use gasoline, kerosene, steam, etc.

For atmospheric temperatures above 32° Fahrenheit, use Mineral Oil Gear Lubricant SAE No. 90 in the transmission and overdrive.

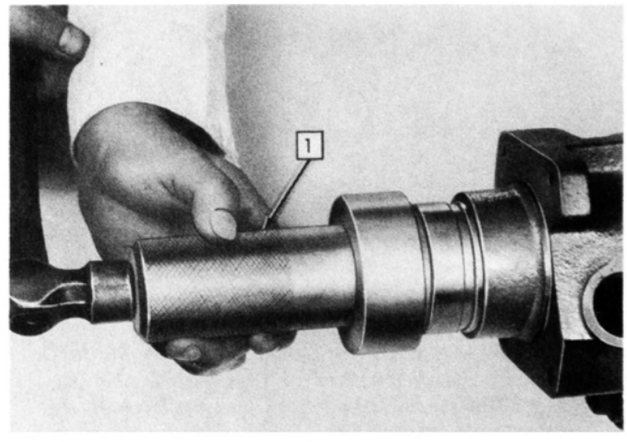
Below 32° Fahrenheit, use SAE No. 80.

Where difficulty in shifting is experienced in sub-zero temperatures, dilute the transmission and overdrive oil as required, using light engine oil.



1. Snap Ring

FIGURE 34—*Use Snap Ring Pliers to Install the Snap Ring.*



1. Tool J-1556

FIGURE 35—*Install the Oil Seal.*

LUBRICATION CHART
NASH TRANSMISSIONS AND OVERDRIVES

STANDARD	CAPACITY (U. S. MEASURES)	INCLUDING OVERDRIVE	CAPACITY (U. S. MEASURES)
"Ambassador" Series	2¼ pts.	"Ambassador" Series	3½ pts.
"Statesman" Series	2¼ pts.	"Statesman" Series	3½ pts.
"Rambler" Series	1½ pts.	"Rambler" Series	2¾ pts.

TECHNICAL SERVICE LETTER REFERENCE

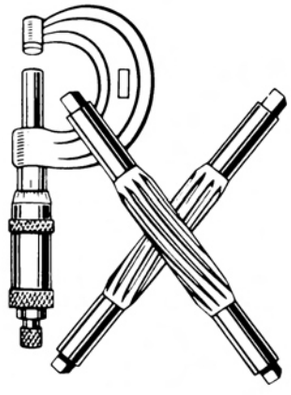
Date	Letter No.	Subject	Changes information on Page No.

TECHNICAL SERVICE LETTER REFERENCE

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TECHNICAL SERVICE MANUAL



HYDRA-MATIC TRANSMISSION

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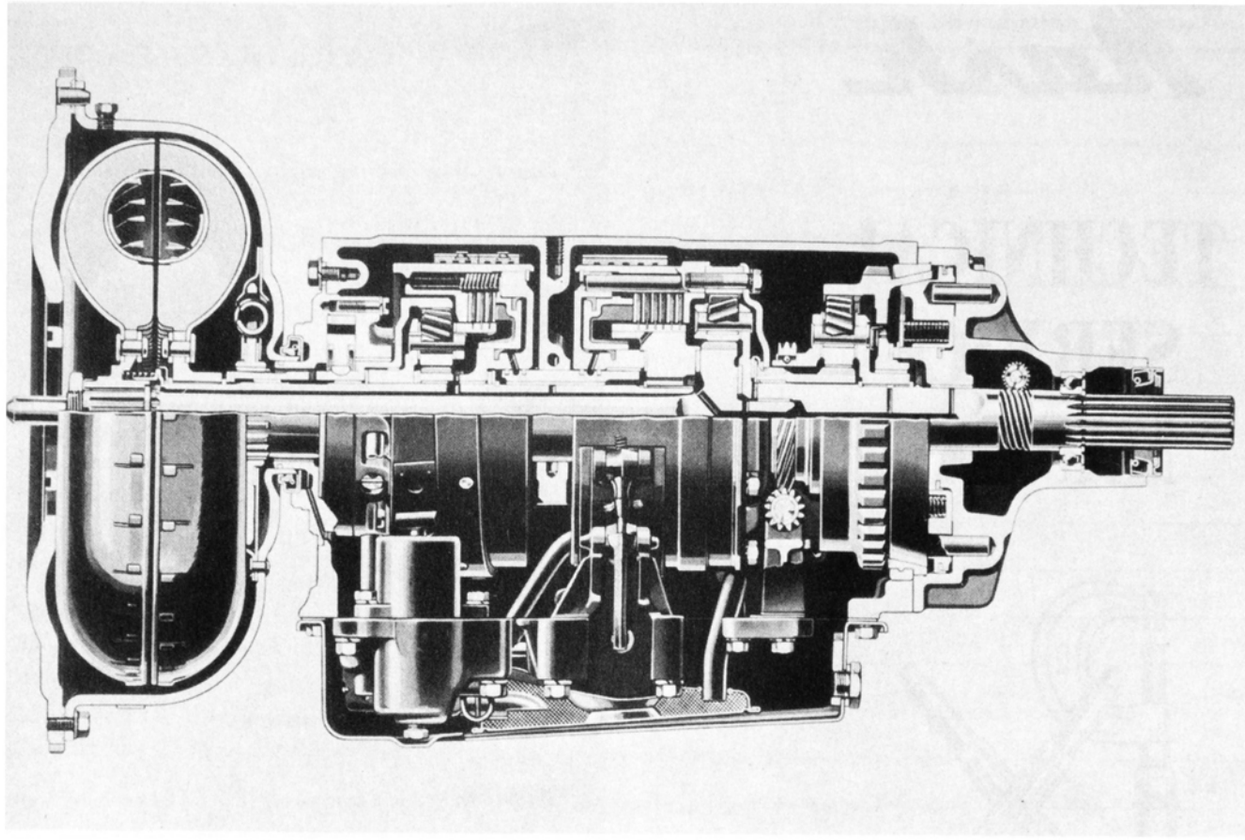
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HYDRA-MATIC TRANSMISSION

HYDRA-MATIC TRANSMISSION SECTION



Cross Sectional View of Hydra-Matic Transmission

GENERAL DESCRIPTION

The Hydra-Matic Drive consists of a fluid coupling which replaces the clutch and is combined with a hydraulically controlled automatic transmission having four speeds forward and one reverse.

With Hydra-Matic Drive, the clutch pedal operation and conventional gear shifting are eliminated. The gear ratio in which the car is operating at anytime is selected automatically in accordance with the performance demands by road condition and the car driver.

The selector lever position selected, will always provide the maximum efficiency under any combination of conditions.

HOW TO OPERATE HYDRA-MATIC

The selector lever (Fig. 1), located just below the steering wheel is used to select neutral, forward speed ranges or reverse. The selector lever also functions as the starter lever when raised in the neutral position. These positions are all shown on the indicator which is illuminated when the instrument lights are on. These positions are as follows:

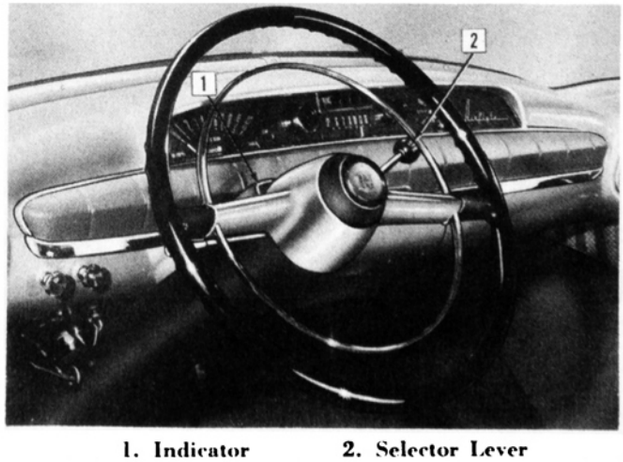
N—Neutral.

D-4—For all normal forward driving.

D-3—For additional acceleration, congested traffic, or braking power.

L—Prevents transmission from shifting above second speed and for maximum pulling power.

R—For reverse. (Note: Selector lever must be raised to engage low and reverse position.)



1. Indicator 2. Selector Lever

FIGURE 1—*Indicator and Selector Lever.*

HYDRA-MATIC TRANSMISSION SECTION

Engine Starting Instructions

The starting circuit is wired so the starter will not operate unless the selector lever is in the neutral position, press accelerator pedal, part way, to toeboard once, and release (in order to set the AUTOMATIC CHOKE on fast idle). Turn the ignition switch "on" and place the Hydra-Matic selector lever in N (neutral) position, and lift up selector knob (toward the steering wheel) to engage starter.

NOTE: *When starting a warm or hot engine hold accelerator pedal down half way while lifting the selector knob.*

CAUTION: *Do not "pump" the accelerator pedal at any time. Avoid racing the engine during the warm-up period.*

NOTE: *Should the car fail to start in five to ten seconds, it is possible that the engine is flooded. In that case, it will be necessary to open the throttle to the wide open position while continuing to operate the starter.*

Operating in D-3 or D-4 Range

After the engine is started, move the selector lever to D-3 or D-4 position and leave it in this position for all normal forward driving. When the engine is cold and may be running on fast idle, the car will tend to creep forward when the selector lever is moved to the D positions. A slight application of the foot brake or hand brake will hold the car during this condition. After releasing the brakes, the car will move forward when the accelerator pedal is depressed.

Acceleration

The shift events from first speed to second, second speed to third (D-3), and third to fourth (D-4) will occur at different car speeds depending upon the amount of accelerator pedal pressure. With a slight accelerator pedal pressure, the shift events will be at lower speeds. As accelerator pressure is increased, the car speed at which the shift event will occur will be higher.

The transmission will automatically shift into second speed somewhere between six and twenty-one miles per hour, into third speed between ten and thirty-seven miles per hour, and into fourth speed between nineteen and sixty-nine miles per hour.

Forced Downshift, Fourth to Third—Third to Second—Second to First

When driving on the open highway at speeds below 60 miles per hour, an extra burst of speed needed for passing can be secured by pressing the accelerator pedal all the way down; but it will be noted that a slight resistance must be overcome

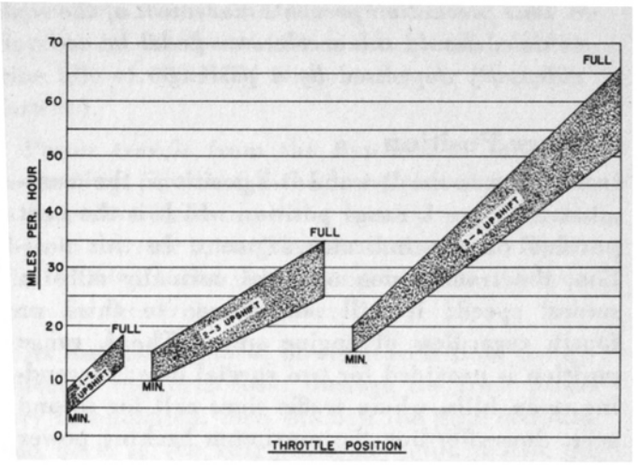


FIGURE 2—*Approximate Upshift Speeds.*

to produce this downshift. The drive then changes from fourth speed to third for rapid pickup and returns to direct drive automatically at some higher speed, depending upon how soon the accelerator pedal is released. If the accelerator pedal is held all the way down, the shift returns to fourth at approximately 70 miles per hour.

When driving at speeds less than 20 MPH in drive range, the transmission will downshift from second to first by pressing the foot accelerator all the way down.

When driving at speeds less than 10 MPH in either drive or low range, the transmission will downshift from second to first by pressing the foot accelerator all the way down.

Deceleration

When car is decelerating with the accelerator pedal free and the selector lever in D-4 position, the shift from fourth speed to third occurs automatically at approximately sixteen to twelve miles per hour. Continuing to decelerate, the transmission will automatically shift to lower speeds.

Stopping the Car

To stop the car, merely release the accelerator pedal and apply the brakes in the conventional manner. Leave the selector lever in either D position; the engine is then "in gear" and helps to slow down the car until its speed reaches a few miles per hour. The slippage of the fluid coupling is sufficient to prevent the engine from stalling.

CAUTION: *Under no circumstances should the selector lever remain in any other position except N when driver leaves car, with the engine still running. For additional safety, apply parking brake when opening garage doors or removing mail from rural mail box, etc.*

This precaution prevents movement of the vehicle, should the accelerator pedal be accidentally depressed by a passenger.

L Range Position

In addition to the D-4 and D-3 positions, the transmission has an L range position which is the next position on the indicator segment. In this position, the transmission operates normally only in second speed; it will not change to third or fourth regardless of engine speed. The L range position is provided for two special uses; descending steep hills, where traffic signs call for second gear, thus affording the maximum braking power of the engine, and pulling through deep sand, or up steep grades.

The change from either D to L range position can be made at any speed below 39 miles per hour on dry pavement where traction is good. It is not recommended to use the L range on slippery pavement since its use could induce a skid. On slippery roads safety demands that car speed be reduced by judicious use of the brakes.

Reverse

To engage reverse, (vehicle speed must be below 10 MPH) raise the lever slightly, and move the lever to the R position.

Parking

For additional safety, when the car is parked, it can be held in gear by placing the lever in R position and shutting off the engine. The parking pawl will then engage the external teeth of the reverse internal gear.

Coasting

When coasting in neutral with the engine shut off, the rear oil pump in the transmission is in operation. It must supply sufficient oil pressure to lubricate the transmission and also, keep the rear band released to maintain the transmission mechanism in neutral. If this rear oil pump pressure should drop for any reason, (such as low fluid level, etc.) serious damage to the transmission may result.

Therefore, to maintain better control of the car and to prevent possible damage to the Hydra-Matic unit, it is advisable to keep the selector lever in D or L range position when traveling.

Pushing to Start the Engine

It is possible to start the engine by pushing the car. Should this ever be necessary, the car should be pushed in N (neutral) until a speed of approximately 20 MPH is reached, the ignition switch then turned on, and the selector lever moved to D range position (never to L), the rear wheels then drive the engine.

CAUTION: *Do not push car faster than 25 MPH and more than two miles distance as damage to the transmission may result.*

Hydra-Matic Drive Fluid

It is important to use only Hydra-Matic Drive Fluid in the Hydra-Matic transmission.

It is an all-season fluid, ideal for year-round operation.

Ordinarily, flushing of the unit is not necessary; however, if it is flushed for any reason, use only Hydra-Matic Drive Fluid.

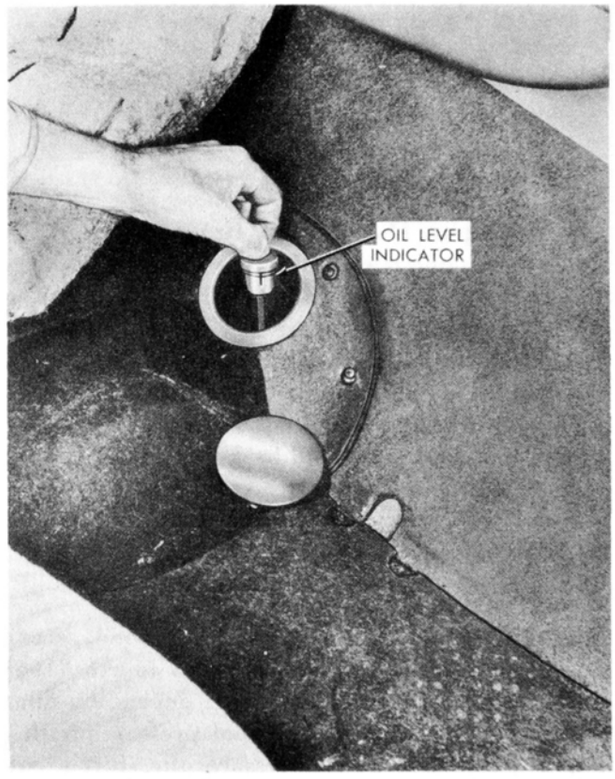


FIGURE 3—*Oil Level Indicator.*

Serial Number

A name and serial number plate is attached to the right-hand side of each Hydra-Matic transmission case. This serial number should be included in any report concerning the operation of the unit. In cases where parts interchangeability is affected, the serial number will aid in identifying parts.

HYDRA-MATIC DRIVE COMPONENTS

The Hydra-Matic transmission contains two planetary gear trains arranged to provide four speeds forward. This is accomplished by various combinations of bands and clutches. It also contains a third planetary gear train for reverse. In all forward speeds the reverse planetary unit has no

HYDRA-MATIC TRANSMISSION SECTION

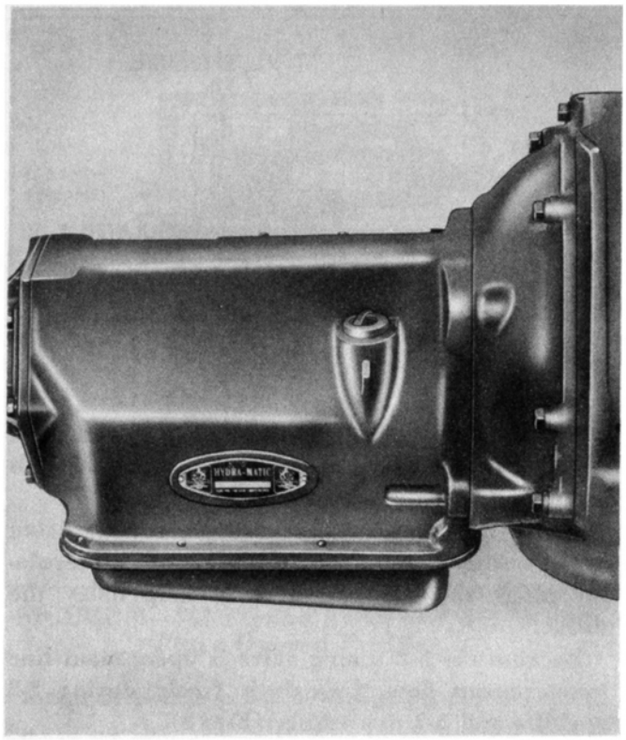


FIGURE 4—*Transmission Serial Number*

function and simply revolves with the output shaft (Fig. 5).

Drive Torus

When the car is standing, with the engine running and the selector lever in D, L or R range, the drive torus turns at 7/10 engine speed. This reduction in the front unit makes possible an engine idle of 375 RPM without the car "creeping" forward.

Power travels from the flywheel to the torus cover (Fig. 6) through the front planetary, which is in reduction because the band is applied, and then to the rear torus. The rear torus in the Hydra-Matic Drive is the drive member while the front torus is the driven member.

As the vehicle starts, power travels from the flywheel to the torus cover through the front planetary in reduction, then through the fluid coupling and back to the rear planetary unit. When the speed of the vehicle has increased to a point where the reduction of the front planetary unit is no longer required, the front planetary shifts to direct drive and the drive torus turns at the same speed as the engine.

CONTROL VALVE ASSEMBLY

The control valve assembly consists of a manual valve (the only valve operated by manual control), shifter valves, governor plugs, detent plugs, transition valve, compensator valve, throttle valve, regulator valve, regulator plug, timing valve, and springs which are operated through oil pressure.

These shifter valves, plugs and springs control the shifting in all driving ranges.

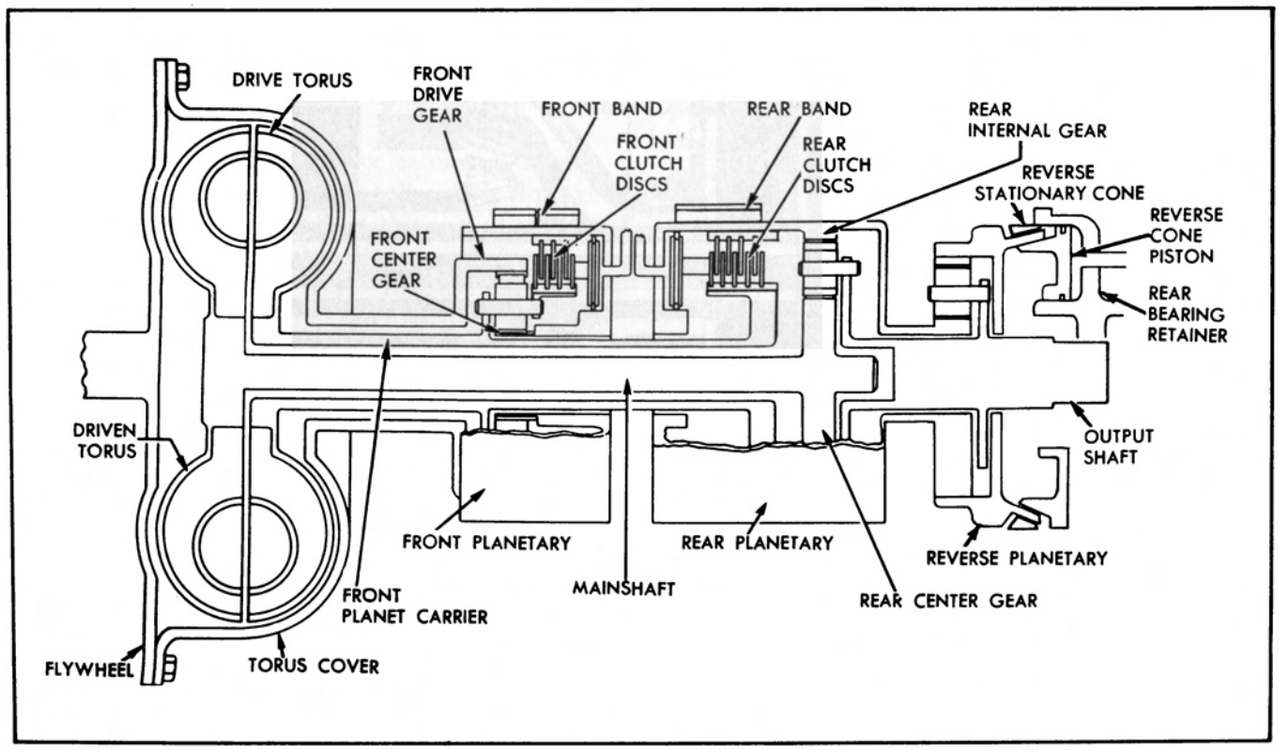


FIGURE 5—*Location of Hydra-Matic Components.*

The control valve assembly incorporates valves for forced downshifts from fourth to third, third to second and second to first.

The throttle valve regulator valve regulates throttle or T.V. pressure. This regulated T.V. pressure is then delivered to the regulator plugs and shift valves to help delay the shifts.

The T.V. regulator valve is controlled by T.V. pressure and spring tension. When T.V. pressure reaches a certain value, it opens the T.V. regulator valve and allows regulated T.V. pressure to act on the regulator plugs and shifter valves, to help time the shifts. On light throttle upshifts, there will be no T.V. pressure to delay the shifts, while on heavy throttle upshifts, regulated T.V. pressure improves the shifts. When T.V. pressure reaches approximately 60 PSI, the T.V. regulator valve will close the exhaust port, allowing regulated T.V. pressure to become normal T.V. pressure (Fig. 7).

The 3-2 timing valve delays the application of the rear band until the front clutch is applied during a 3-2 forced downshift, thus providing a smoother shift.

The operation of the 3-2 timing valve and the 3-2 detent plug are as follows: The 3-2 detent plug

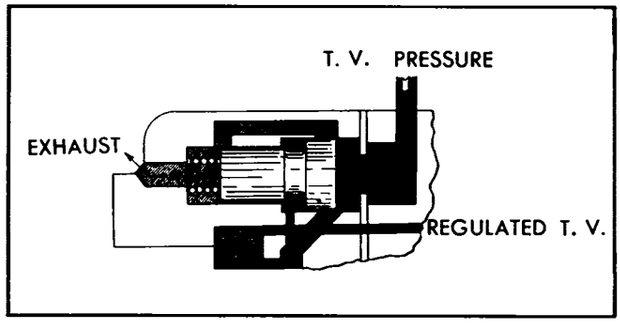


FIGURE 7—*Schematic Drawing of T.V. Regulator Valve.*

remains closed and the 3-2 timing valve open until the accelerator pedal is depressed down through the detent.

When the 3-2 detent plug is closed, regulated T.V. pressure flows through it to act on the regulator plugs and shifter valves to help delay the shifts.

Because the 3-2 timing valve is open, main line pressure can flow through it freely during 2-3 upshifts and 3-2 downshifts (Fig. 8).

When the accelerator pedal is depressed down through the detent and the car is going slow

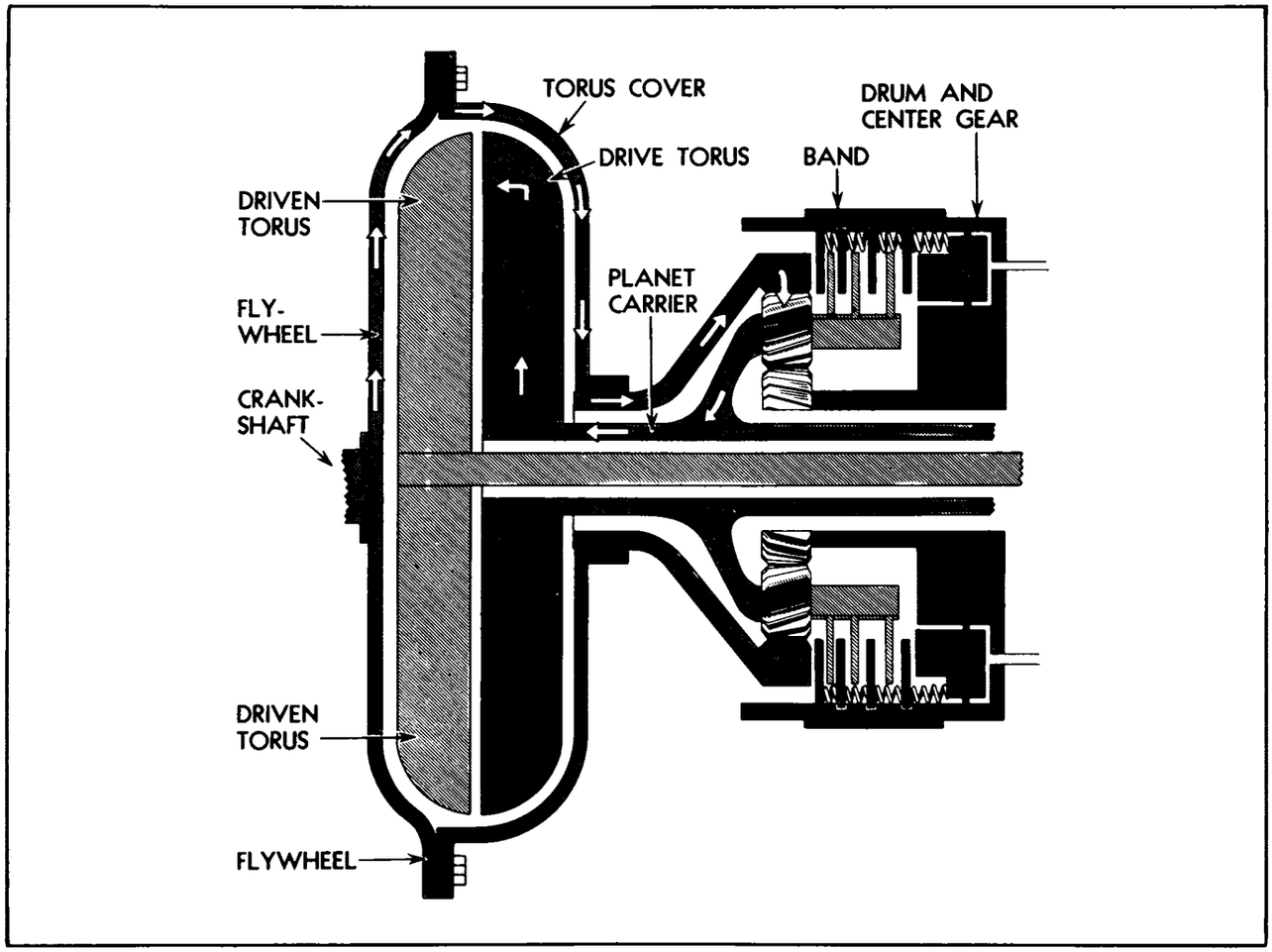


FIGURE 6—*Drive Torus Speed Reduced.*

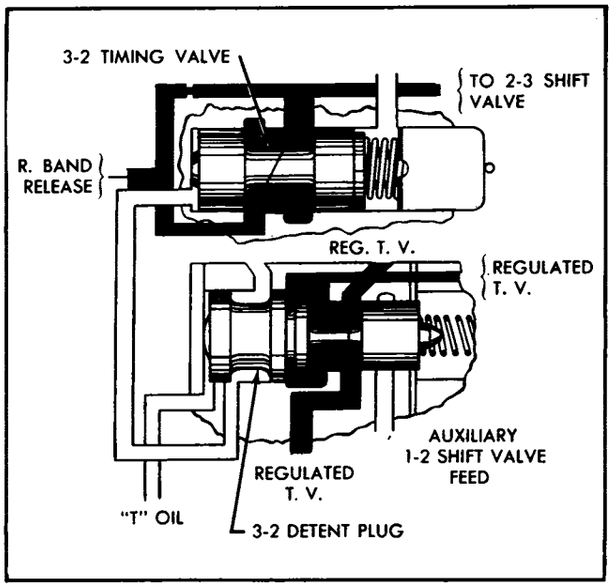


FIGURE 8—*3-2 Timing Valve and 3-2 Detent Plugs Opened Position.*

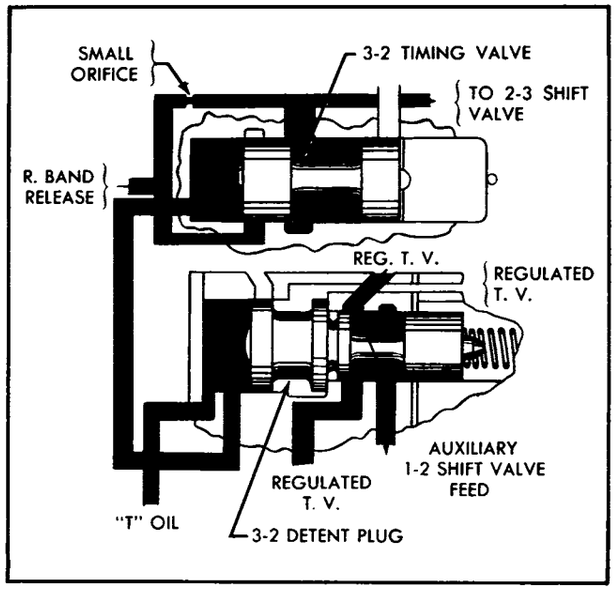


FIGURE 9—*Timing Valve and Detent Plug—Closed Position.*

enough to obtain a 3-2 downshift, main line pressure from the "T" valve will open the 3-2 detent plug which moves the 2-3 shift valve to the closed position.

With the 3-2 detent plug opened, regulated T.V. pressure to the 2-3 shifter valve is shut off. Main line pressure from the "T" valve flows past the large end of the 3-2 detent plug to close the 3-2 timing valve.

Regulated T.V. pressure (main line pressure at full throttle) flows into a passage uncovered by the small end of the 3-2 detent plug. This passage delivers oil to the 1-2 shift valve through a larger port than normal in order to insure a fast application of the front clutch.

Because the 3-2 timing valve is closed, release oil from the rear servo that is exhausting through the 2-3 shift valve, must flow through the small orifice by the timing valve. This results in slow application of the rear band. Because the front clutch is applied quickly, and the rear band is applied slowly, the transmission will shift into second speed smoothly (Fig. 9).

OPERATION OF FRONT SERVO

Neutral

When the selector lever is in N position there is no oil pressure to the servo and the retracting spring holds the servo apply piston in the released position.

Servo Applied—1st, 3rd, and Reverse

Main line pressure from the manual valve is directed to hold the front servo in the applied position in all ranges except neutral. At speeds less than approximately 25 MPH, main line pressure to apply the servo keeps the 4-3 downshift valve out, allowing free flow of oil to the servo apply piston. At speeds above approximately 25 MPH, G-1 pressure from the governor is great enough to move the valve, to restrict the oil flow, which delays front band application and permits the necessary engine speed increase before the front unit goes into reduction during the 4-3 downshift. This same condition exists on full throttle 2-3 upshifts.

When the front servo is applied, main line pressure flows through the over-run control valve to act on the back of the release piston. Main line pressure on this area provides the additional holding of the front band, necessary when using the engine as a brake in third gear (Fig. 10).

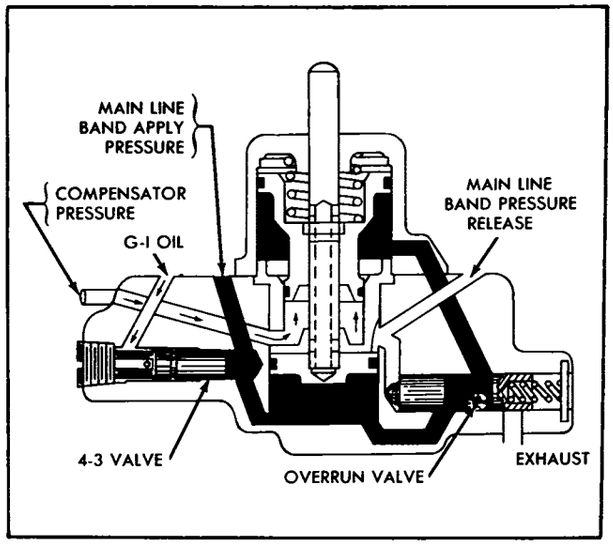


FIGURE 10—*Front Servo Applied.*

Servo Released—2nd and 4th

When the transmission shifts into second or fourth speeds, the front band is released. Main line band release oil pressure coming into the front servo acts on the back of the apply piston, travels through the servo stem and acts on the release piston. Band release oil also moves the over-run valve cutting off the flow to the rear of the release piston and allows the oil that did act on the back of the release piston to exhaust.

Spring pressure, plus oil pressure, acting on the release piston and back face of the apply piston releases the front servo (Fig. 11).

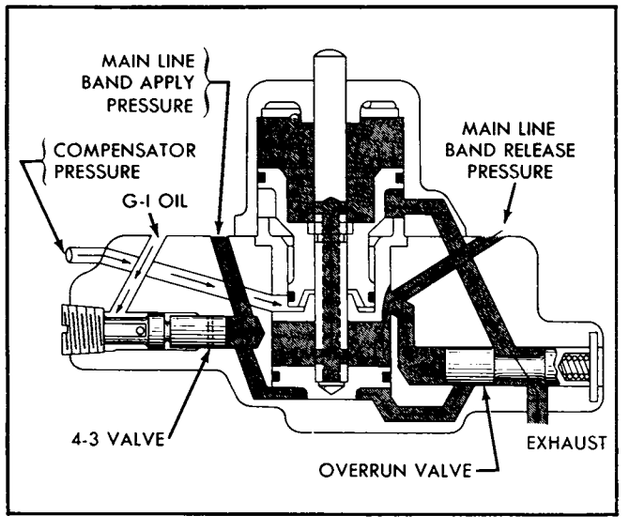


FIGURE 11—*Front Servo Released.*

OPERATION OF REAR SERVO

The rear servo is designed to allow a fast rear band application in "L" range, speeding up the low and reverse engagement for rocking the car. Rapid rear band application is provided by directing low range oil pressure against the rear servo exhaust valve. Low range oil pressure moves the exhaust valve over against spring pressure, opening a passage which rapidly exhausts rear servo release pressure. In drive range the rear servo exhaust valve is inoperative (Fig. 12).

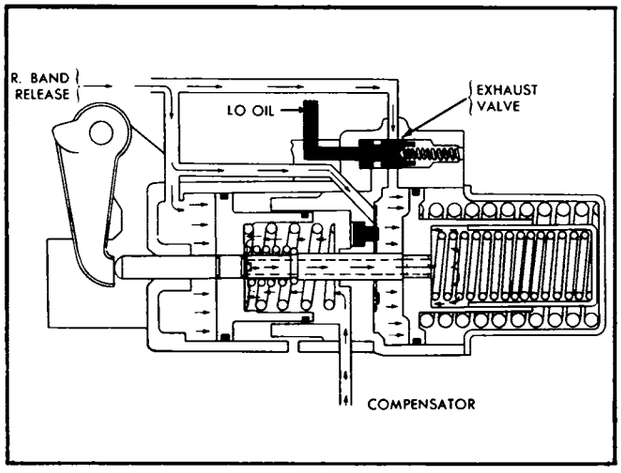
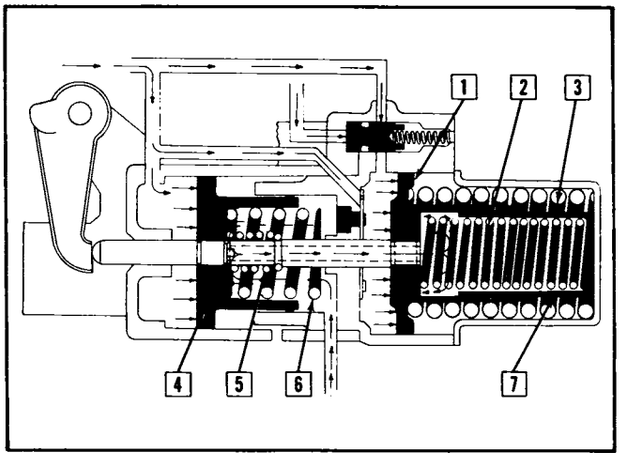


FIGURE 12—*Rear Servo Low Range Oil Pressure and Exhaust Valve.*

Apply

The rear servo is applied by the servo springs which operate on the accumulator piston, the stem of which contacts the booster piston applying the band (Fig. 13).



1. Accumulator Piston
2. Compensator Spring
3. Servo Spring
4. Booster Piston
5. Accumulator Apply Spring
6. Booster Spring
7. Compensator Piston

FIGURE 13—*Rear Servo Band Apply Springs and Pistons.*

Compensator Pressure

Compensator pressure is applied at A and B to assist the servo springs to prevent the band slipping under rapid acceleration. Compensator pressure is always present with carburetor throttle opening and increased with continued throttle opening (Fig. 14).

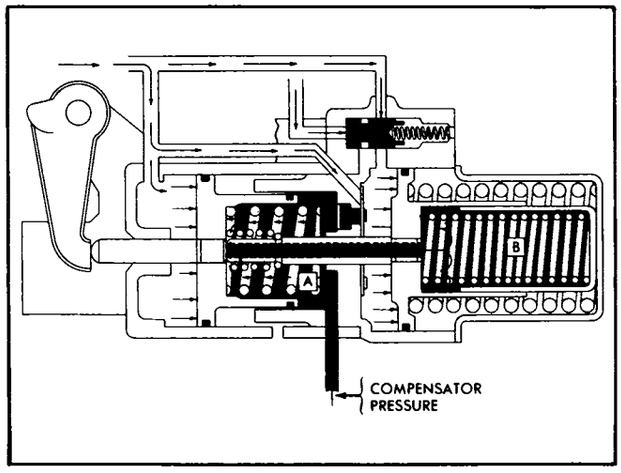


FIGURE 14—*Rear Servo Compensator Pressure.*

Release

Regulated main line pressure is applied at points C and D to release bands. The force applied at

these two areas is greater than the force of the servo springs and compensator pressure and the servo pistons are moved to the released position (Fig. 15).

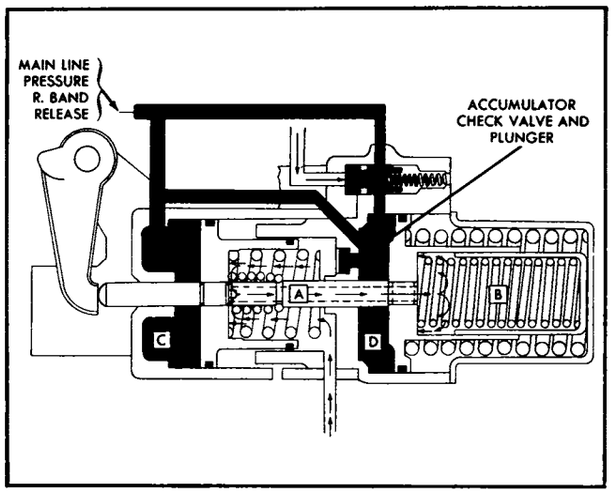


FIGURE 15—*Rear Band Release.*

Rear Servo Accumulator Check Valve and Plunger

The accumulator check valve controls the passage through which oil flows to the face of the accumulator piston at D (Fig. 15). The oil going through this passage lifts the check valve off its seat and allows the oil to flow through freely to release the band.

These are two different ways in which this valve operates when the servo is being applied, namely, closed and open carburetor throttle.

On a closed carburetor throttle down-shift when main line pressure applied at point D is released, the check valve then returns to its seat, causing the oil under the accumulator piston to pass through the small hole in the check valve and in this way delays application of the band (Fig. 15).

On an open carburetor throttle downshift, compensator pressure is effective at points A and B and also on the end of the check valve plunger which is connected to the accumulator check valve.

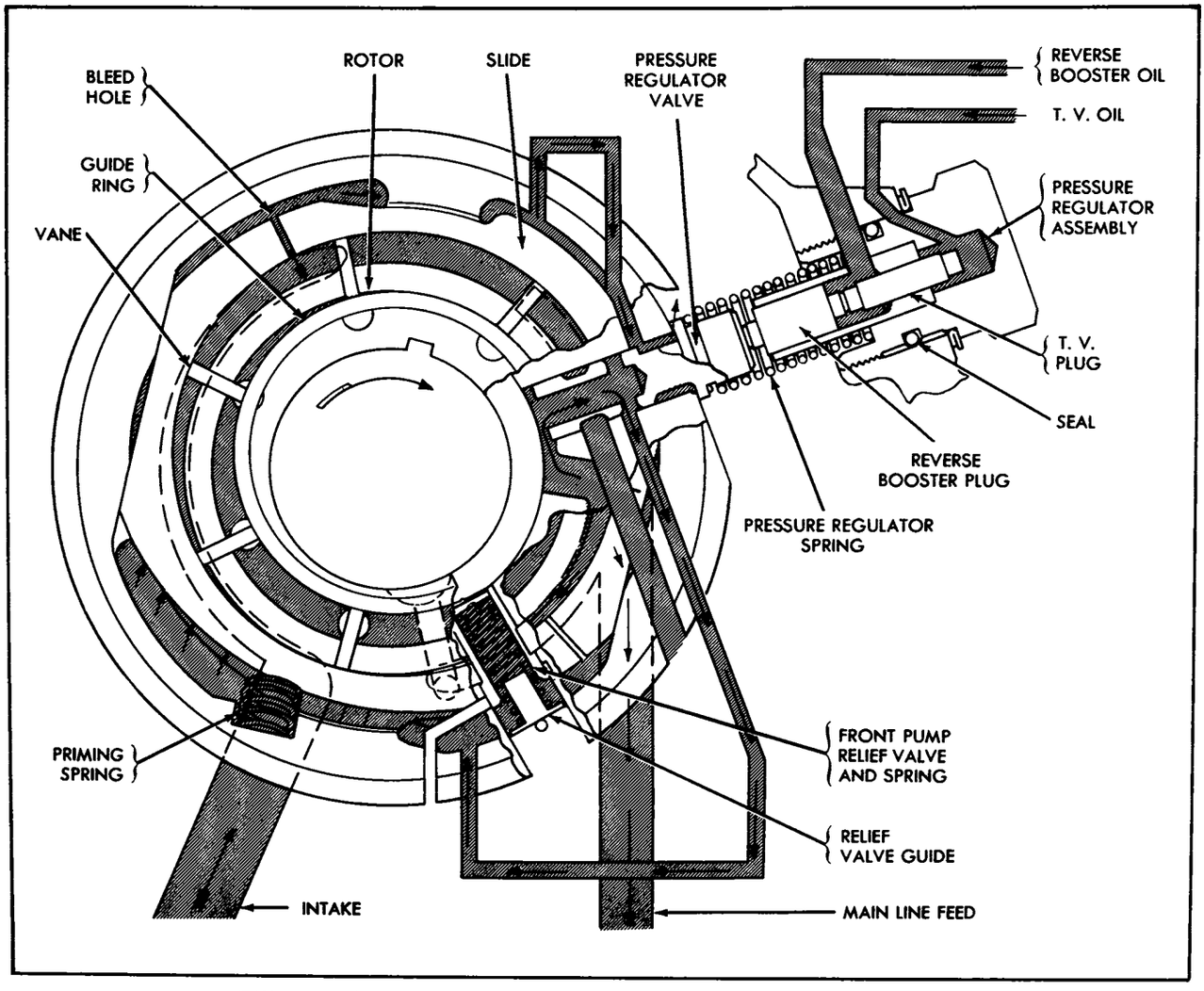


FIGURE 16—*Schematic Drawing of Front Oil Pump (Slide Up).*

When the pressure applied at point D is released the compensator pressure applied on the check valve plunger holds the check valve off its seat and the oil under the accumulator piston is allowed to exhaust freely for a rapid application of the band (Fig. 15).

PRESSURE REGULATOR ASSEMBLY

The pressure regulator, valve which is controlled by the pressure in the system, positions the slide in the front pump to control the pump output. It also contains the throttle valve pressure plug and reverse booster plug.

FRONT OIL PUMP ASSEMBLY

The transmission has a vane type pump which pumps only the amount of oil required in the system. In place of gears, the pump has paddles called vanes. The vanes are rotated in a circle within a slide, and the output of the pump is determined by the position of the slide. When the slide is up the pump delivers maximum output; when the slide is centered the output is zero.

The pressure regulator, which is controlled by pressure in the system, positions the slide to control pump output.

A priming spring keeps the slide up to insure maximum output when the pump is started. However, the spring has no effect on the pump once it is primed.

The front oil pump consists of the pump body, cover, slide, rotor, seven vanes, two guide rings, relief valve and a priming spring.

The pump rotor is turned by the front drive gear which is driven by the engine. The priming spring keeps the slide up causing the pump to deliver maximum output to the transmission. The pressure regulator valve spring holds the valve in until the transmission hydraulic system comes up to operating pressure. This allows the pressure regulator valve to meter oil into the lower chamber, thus oil pressure keeps the slide up. If any oil

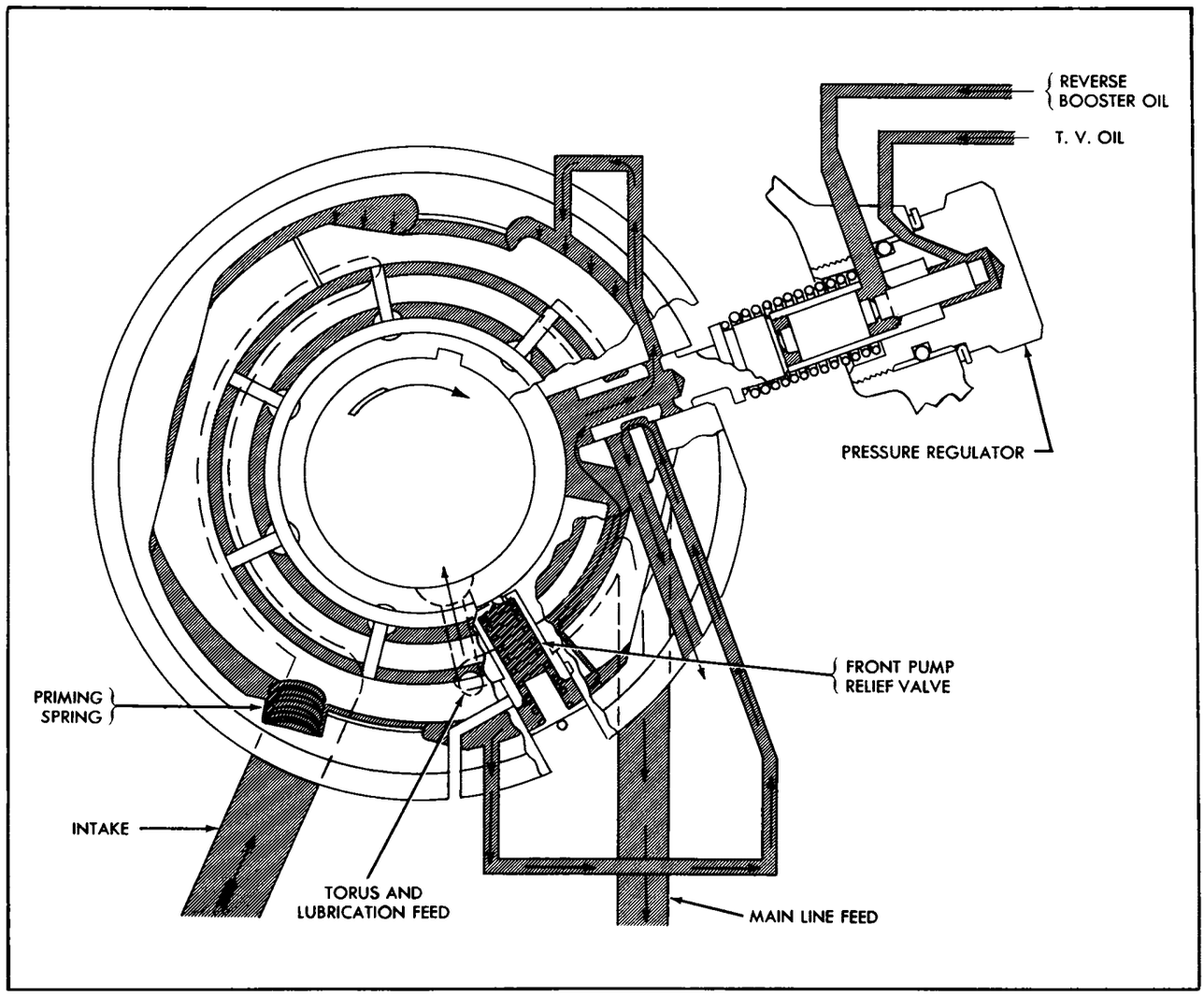


FIGURE 17—*Schematic Drawing of Front Oil Pump (Slide Down).*

should be trapped in the upper control chamber, it will bleed through the hole in the slide to the suction side of the pump or exhaust past the land on the pressure regulator valve (Fig. 16).

When the transmission system comes up to pressure, the pressure regulator will move out against spring pressure and T.V. pressure. With the pressure regulator in the out position, pump pressure is directed through the pressure regulator to build up pressure in the upper control chamber. Pressure in the lower chamber is allowed to exhaust by the pressure regulator. The slide then moves down reducing the output of the pump.

As the slide moves down, it uncovers a port that allows pump pressure to flow to the fluid coupling and supply lubrication.

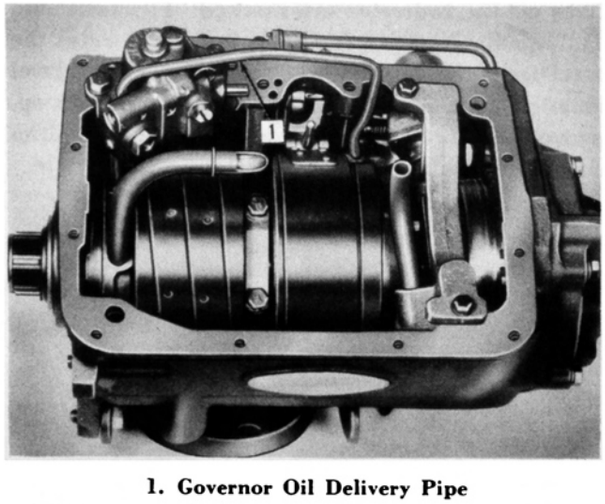
Since the pump supplies the proper amount of oil to the system at any time it is running, the front pump relief valve has no effect while the front pump is operating. However, the front pump relief valve is required in order to relieve excessive output of the rear pump which may develop when the car is being towed and the front pump is not operating (Fig. 17).

GOVERNOR

The governor controls the flow of oil to the shifter valves, 3-4 lockout valve and reverse blocker piston depending upon vehicle speed.

Governor Oil Delivery Pipe

The governor oil feed pipe is assembled between the front servo and the case near the parking brake bracket assembly. Oil feeding the governor bypasses the control valve assembly by flowing directly from the front servo, through the case into the parking brake bracket assembly to the governor (Fig. 18).



1. Governor Oil Delivery Pipe

FIGURE 18—*Governor Oil Delivery Pipe.*

PARKING BRAKE BRACKET ASSEMBLY

The main line oil pressure flows through the governor oil delivery pipe, directly to the governor feed passage in the parking brake bracket body and indexes with a passage in the case. A recessed pin holds the parking blocker piston release spring in position. The parking blocker piston releases the parking pawl (which is only used for parking) when the selector lever is placed in the "R" position and the ignition turned off. The reverse blocker piston engages the reverse lever (through G-1 governor pressure) preventing the driver from placing the selector lever into reverse above 10 MPH.

MAIN LINE EXHAUST VALVE

The main line pressure exhaust valve, is installed in the transmission case under the front servo. Whenever either or both oil pumps are operating the valve is held closed against the release spring by main line oil pressure. When the engine is turned off and the car is at a standstill, the release spring opens the valve allowing main line oil pressure to exhaust rapidly, permitting a rapid engagement of the parking pawl to the external teeth of the reverse internal gear (Fig. 19).

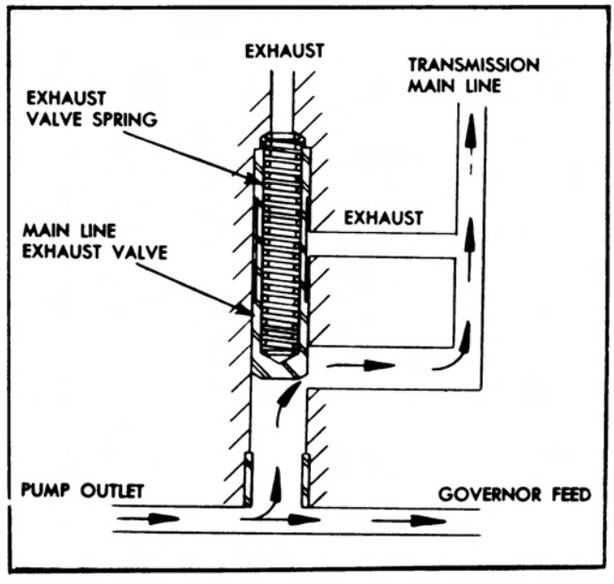


FIGURE 19—*Schematic Drawing of Main Line Exhaust Valve.*

FRICTION TYPE REVERSE

With the selector lever in the "R" position oil flow is directed from the manual valve to the reverse cone clutch which is spring released and oil pressure applied. Oil flow is also directed to the reverse booster plug in the pressure regulator to increase main line pressure to the cone clutch to prevent slippage (Fig. 20).

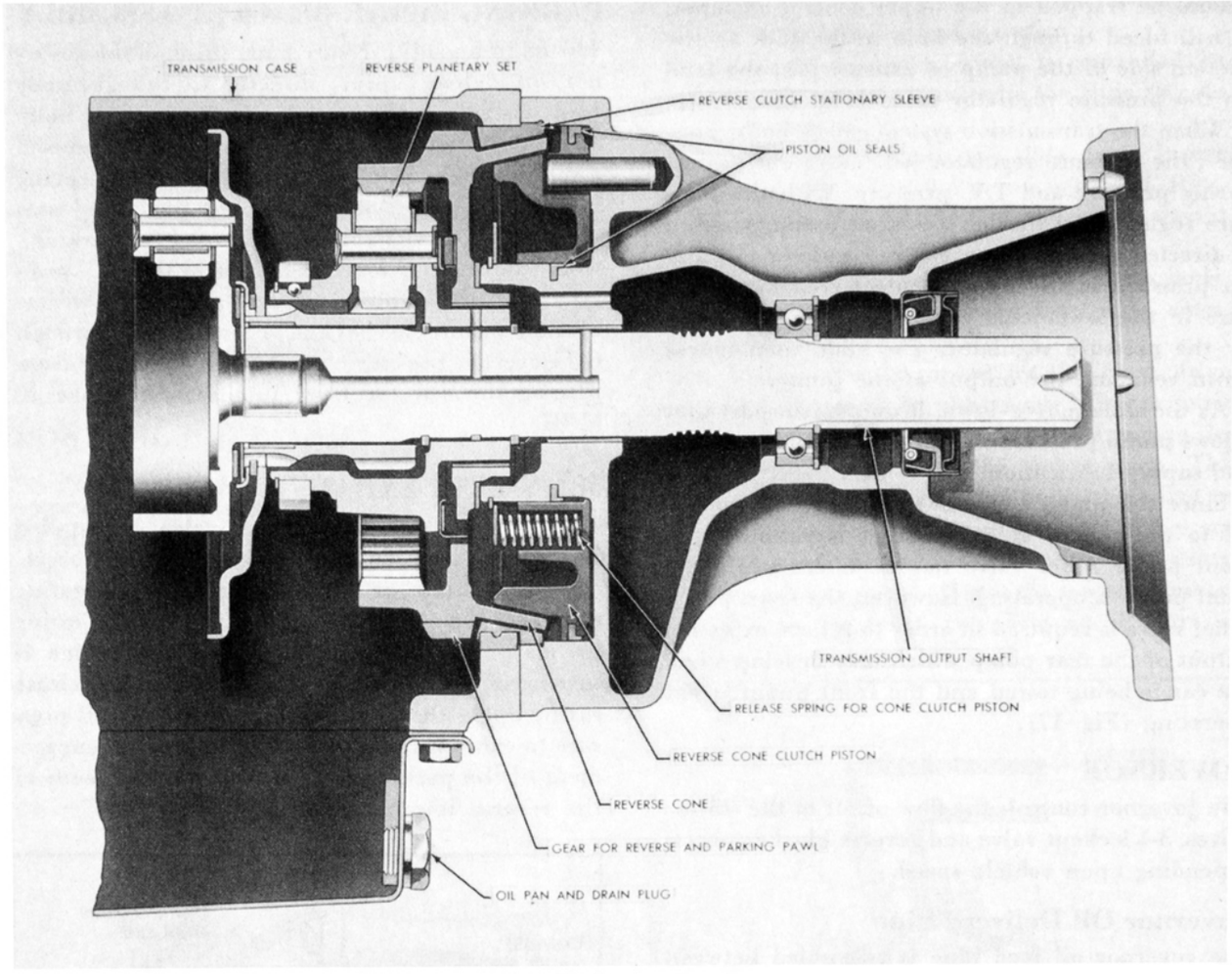


FIGURE 20—*Reverse Cone Clutch Unit.*

PERIODIC SERVICE RECOMMENDATIONS

Transmission Fluid

Hydra-Matic transmission fluid level should be checked every 1,000 miles at the time chassis lubrication is performed.

Checking Oil Level

Cover seat to protect upholstery.

Roll back right side of front floor mat to remove inspection hole cover in floor directly over transmission fluid level indicator.

Remove any sand, dirt, or lint from the floor and around the fluid level indicator so that no foreign matter will fall into the transmission when the indicator is removed.

Set selector lever in "N" (Neutral) position, and apply the hand brake. Run engine at a speed equivalent to 20 MPH for several minutes.

Reduce the engine speed to slow idle (carburetor off the fast idle step), remove the fluid level indicator and wipe clean, and reinsert it in the transmission.

Always check the fluid level with the engine running at idle in order to fill the fluid coupling and obtain an accurate reading.

Remove the indicator and note reading. The two lines on the indicator are marked "F" (full) and "L" (low). It requires 1½ to 2 pints to raise the level from the "L" to "F" mark. If the fluid level is at the "L" (low) mark, add "AQ-ATF" approved Hydra-Matic fluid to bring the level to the "F" mark.

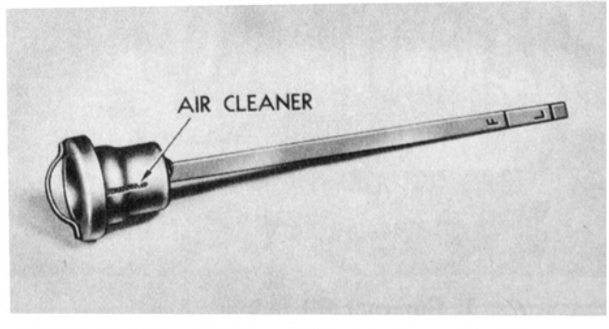


FIGURE 21—*Oil Level Indicator Air Cleaner.*

CAUTION: *Do not fill above "F" mark on fluid level indicator as this will cause foaming when transmission is warm.*

Stop the engine. Replace the fluid level indicator and floor hole cover.

Return floor mat to its original position and remove cover from seat.

NOTE: *If the fluid level is low when checked, and there are indications of fluid leakage, correction should be made to eliminate all leaks.*

Oil Level Indicator

The air cleaner in the oil level indicator cap should be cleaned every 10,000 miles or twice a year (Fig. 21).

New Car—1,000-2,000 Mile Inspections

New car, 1,000-2,000 mile inspections should be performed as outlined on form 1942 Nash Delivery Inspection On New Car, 1,000 and 2,000 Mile Warranty Inspection and Adjustment. For Hydra-Matic equipped cars, the following items must be performed in addition to the conventional operations.

New Car Inspections

1. Inspect starter neutral switch adjustment.
2. Inspect position of selector pointer. Move the selector lever from "N" to "D", stopping when detent is felt. Pointer should then be directly lined up with the Figure 4 or 3.
3. Hydra-Matic fluid level should be to the "Full" mark with engine running.
4. Tighten band adjusting screw lock nuts.
5. Inspect for fluid leaks.
6. Set engine idle speed at 375 RPM with selector lever in "N" position.
7. Inspect throttle linkage adjustment.

1,000 Mile Inspection

Road test car for operation of Hydra-Matic using Hydra-Matic Diagnosis Guide. Inspect items 1, 2, 3, 6, and 7 as listed in New Car Inspection. In addition, adjust the front and rear bands.

2,000 Mile Inspection

Road test car for operation of Hydra-Matic using Hydra-Matic Diagnosis Guide. Inspect items 1, 2, 3, 5, 6, and 7 as listed in New Car Inspection.

General Recommendation

Observe operation of transmission on Hydra-Matic equipped cars when road tested for any reason. Use the Hydra-Matic Diagnosis Guide.

ADJUSTMENTS WITH TRANSMISSION IN CAR

Subject	Page
Throttle Control Linkage	13
Selector Lever Linkage Adjustment	13
Band Adjustments in Car	16
Band Adjustment (Oil Pan Removed)	17

THROTTLE CONTROL LINKAGE

CAUTION: *Linkage operation will not be satisfactory if binding or excessive wear exists.*

Adjust engine idle speed at 375 RPM with engine temperature at 150° to 160°F., transmission warm and selector lever in neutral. Disconnect transmission throttle rod, at throttle lever, at side of transmission (Fig. 24).

Clean machined surface at back of transmission case and place throttle lever checking gauge J-2545-A flush against surface with edge of gauge against transmission side cover. The throttle lever stud should fit freely in notch of gauge (Fig. 25).

If gauge does not pass over throttle lever stud freely, use bending tool J-3310 and bend to proper location. Gauge notch must slide freely on stud pin (Fig. 26).

Adjust transmission throttle rod (which is threaded into upper throttle rod yoke) to fit freely on throttle lever stud; then shorten the rod approximately two turns.

NOTE: *This adjustment is necessary to insure correct throttle control valve operation.*

Install rod on stud and replace wave washer, flat washer, and cotter key.

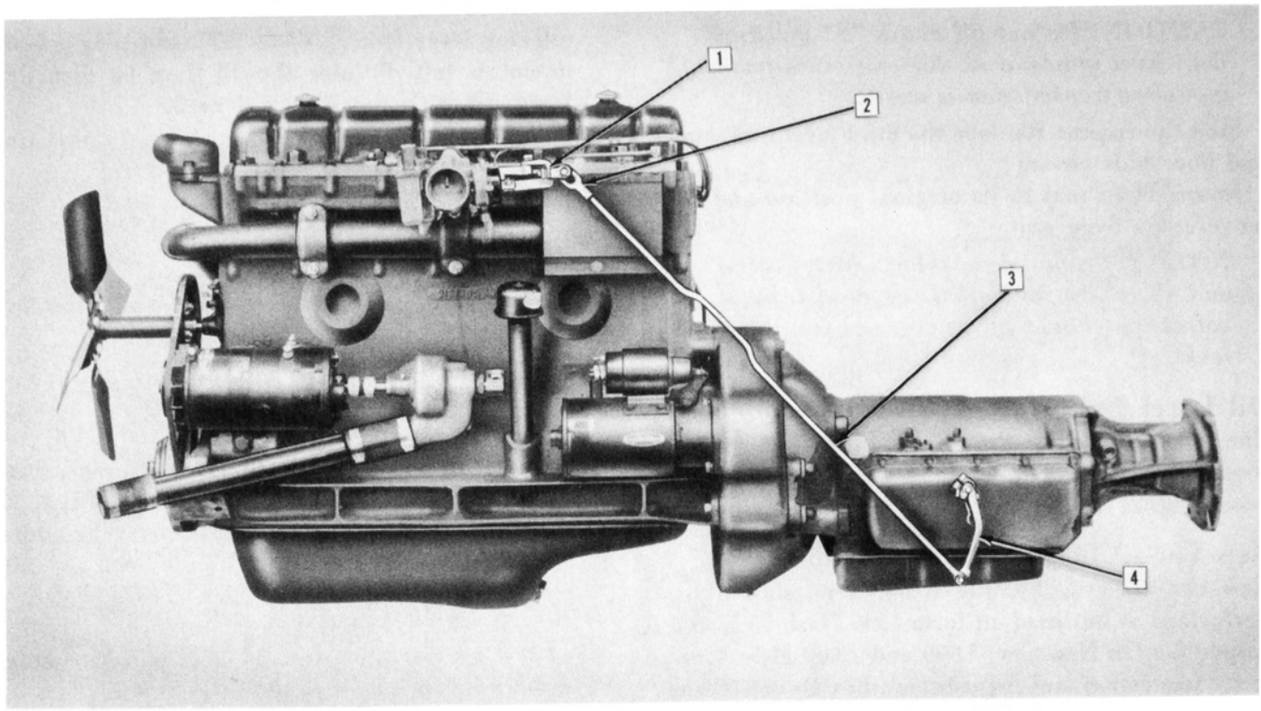
SELECTOR LEVER LINKAGE ADJUSTMENT

CAUTION: *Linkage operation will not be satisfactory if binding or excessive wear exists.*

Place selector lever in the "D-3" position and set the operating lever against the stop on the starter switch bracket.

Remove the clevis pin from the gear shift control rod at side of transmission case and remove clevis from shift lever (See Fig. 24).

Place the transmission outer shift lever in the "D-3" range position (Fig. 27).



1. Throttle Bell Crank
2. Throttle Rod Adjusting Yoke
3. Throttle Rod
4. Throttle Lever

FIGURE 22—*Throttle Control Linkage.*

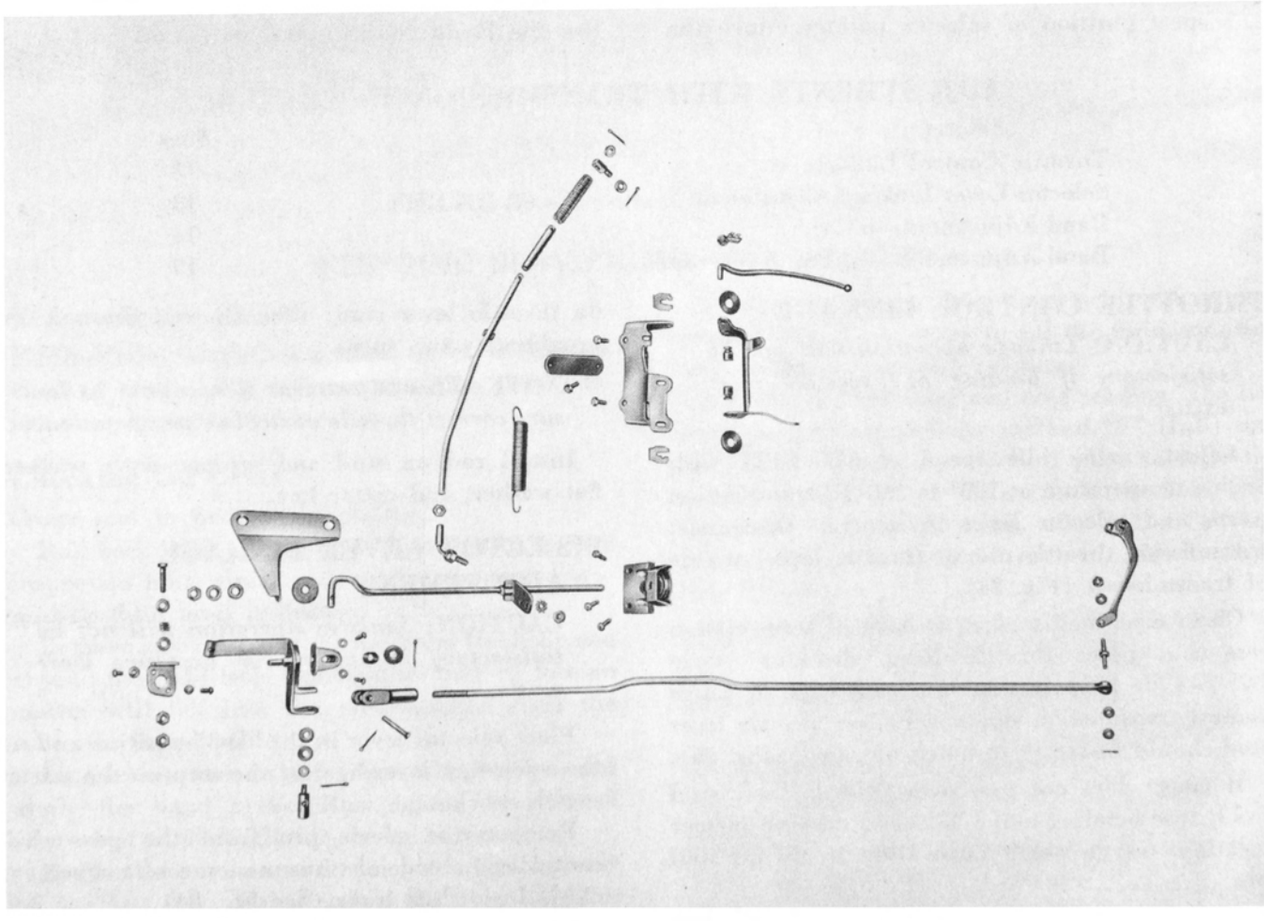
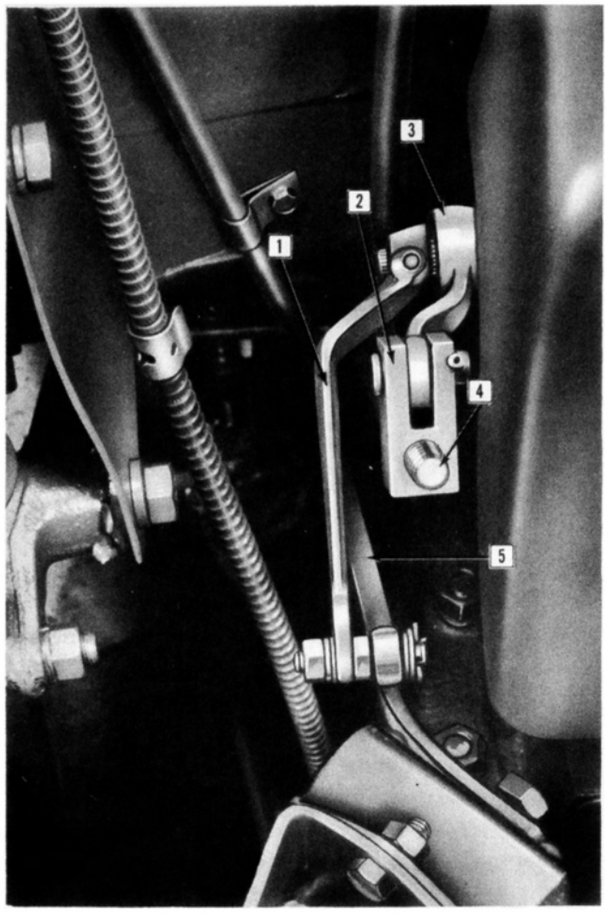


FIGURE 23—*Exploded View of Throttle Control Linkage.*



1. Throttle Lever
2. Shift Control Rod Clevis
3. Shift Control Rod Lever
4. Shift Control Rod
5. Throttle Rod

FIGURE 24—*Remove Throttle Rod From Throttle Lever.*

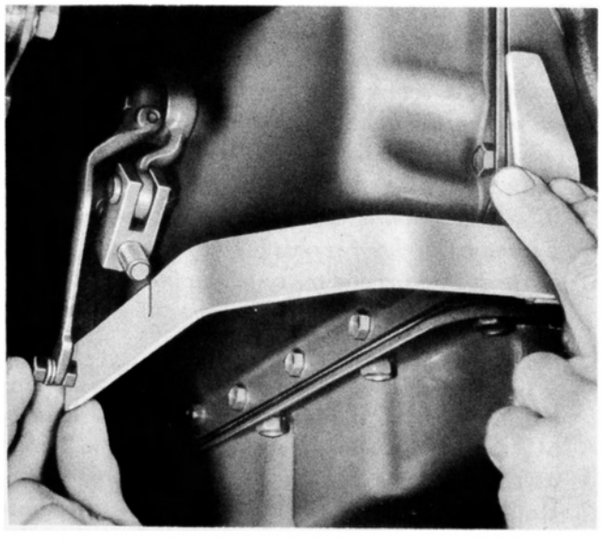
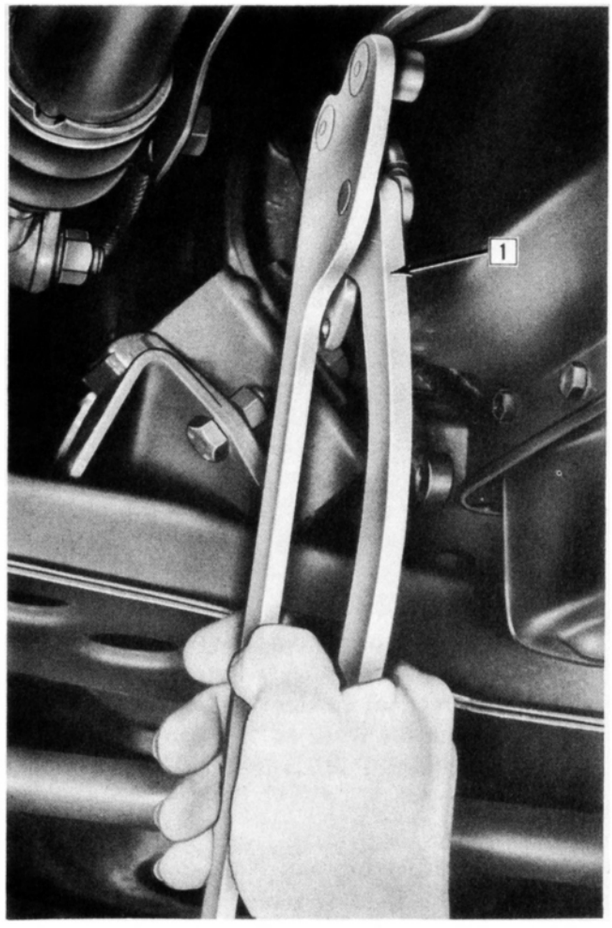


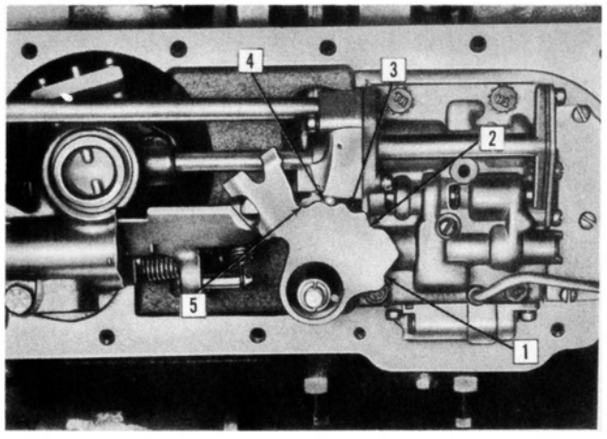
FIGURE 25—*Checking Adjustment of Throttle Lever Location.*

Adjust the clevis so that the clevis pin passes freely through hole in lever.



1. Tool J-3310

FIGURE 26—*Bending Throttle Lever.*



1. R—Reverse
2. L—Low
3. D-3
4. D-4
5. Neutral

FIGURE 27—*Location of Shift Positions.*

NOTE: *Be sure that the operating lever is against the stop on the starter switch bracket.*

After the adjustment has been completed, lengthen the control *rod two full turns* and replace the clevis pin and cotter key.

NOTE: *This adjustment will insure proper detent location in the transmission together with a full reverse engagement.*

BAND ADJUSTMENTS IN CAR

Procedure for Adjusting Hydra-Matic Bands Externally.

CAUTION: *If tool No. J-2681 and tachometer are not available, adjust bands by removing oil pan. Do not attempt to adjust bands externally without tool No. J-2681 and tachometer.*

Set hand brake firmly and block front wheels with wheel blocks to prevent car running forward during adjustment.

Remove accelerator pedal, floor mat, and adjusting hole cover.

Start engine and allow it to run until temperature is normal (choke and fast idle off) before proceding.

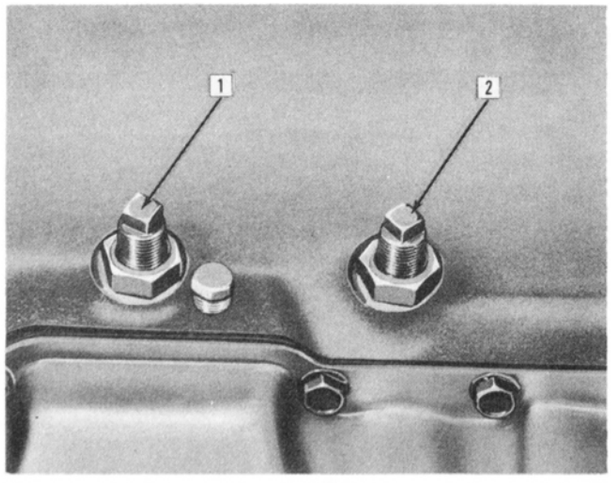
Connect electrical tachometer to engine.

Position selector lever in "D" range.

Adjust carburetor idle speed to 700 RPM.

Front Band

1. Use band adjusting tool No. J-2681 and loosen front band adjusting screw lock nut (Figs. 28 and 29).



1. Front Band Adjusting Screw
2. Rear Band Adjusting Screw

FIGURE 28—*Band Adjusting Screws.*

2. Loosen band adjusting screw until engine speed increases to 900-1,000 RPM (front drum now spinning freely).

NOTE: *If engine fails to increase speed to 900-1,000 RPM, this indicates that the band is slipping badly under normal driving conditions. The bottom pan should be removed and the bands and drums inspected for damage. If no apparent damage is evident, adjust both bands using tools J-1693 and J-5071 as outlined under Front and Rear Band Adjustment—Oil Pan Removed. Then it will not be necessary to reset the bands externally after the pan is installed.*

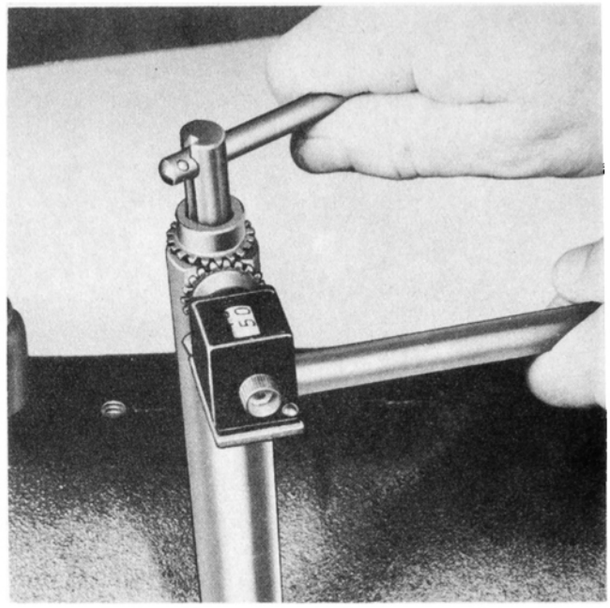


FIGURE 29—*Adjusting Front Band Using Tool J-2681.*

3. Tighten band adjusting screw slowly until engine returns to 700 RPM (front drum now stopped.
4. Loosen band adjusting screw slowly until engine speed increases and tighten again slowly until engine speed returns to 700 RPM.

NOTE: *The object in loosening and retightening the screw is to locate the exact point at which the band stops the drum from spinning. At this point, wait 30 seconds. If engine speed increases, tighten screw 1/10 of a turn. Wait 30 seconds and if engine speed again increases, tighten screw 1/10 of a turn more. Repeat this procedure until engine speed remains at 700 RPM for at least 30 seconds.*

5. Set counter on tool to 00.
6. While holding the lock nut stationary with long handle of tool, tighten adjusting screw exactly 6½ turns with short handle (counter will read 6.5).
7. Hold adjusting screw stationary with short handle and tighten lock nut with long handle.

Rear Band

Repeat operations 1, 2, 3. 4. and 5 under heading Front Band.

Position selector lever in "N" position.

While holding lock nut stationary with long handle of tool, tighten band adjusting screw exactly two turns with short handle (counter will read 2.0).

Position selector lever in "D" range.

Hold adjusting screw stationary with short handle and tighten lock nut with long handle.

Reset engine idle speed at 375 RPM (selector lever in "N" position).

Turn off ignition. Install adjusting hole cover, floor mat, and accelerator pedal.

FRONT AND REAR BAND ADJUSTMENT (Transmission Oil Pan Removed)

Place front end of car on car jacks.

Remove oil drain plug and drain transmission fluid.

Remove engine support cross member.

Remove oil pan.

Remove accelerator pedal and front compartment mat.

Remove band adjusting floor hole cover.

Loosen both servo band adjusting screw lock nuts.

To Adjust Front Band

Loosen front band adjusting screw approximately five (5) turns.

Remove pipe plug from front servo.

Loosen "hex" adjusting screw of gauge J-1693 until approximately 1/8" of threads are exposed above gauge body (Fig. 30).

Screw gauge into front servo, tightening by HAND only.

Tighten the "hex" adjusting screw with fingers until the stem of gauge is felt to JUST touch the piston in front servo.

With a wrench continue tightening the adjusting screw five full turns from the point where it was felt that stem of gauge JUST touched the piston.

Tighten the band adjusting screw until knurled washer on gauge is just free to turn.

NOTE: *While tightening screw, be sure band is lined up over drum.*

Tighten band adjusting screw lock nut securely while holding adjusting screw.

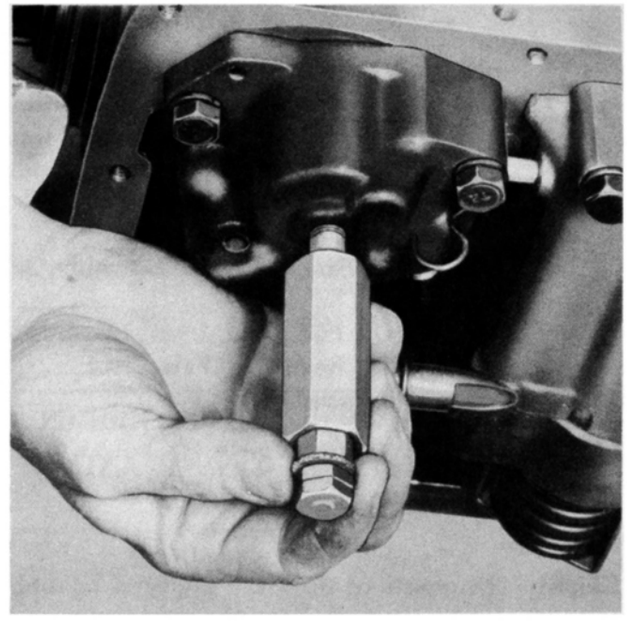


FIGURE 30—*Adjusting Front Band With Tool J-1693.*

Loosen "hex" adjusting screw at least five turns and then remove gauge from servo.

Install pipe plug in servo.

To Adjust Rear Band

Place servo gauge J-5071 on finished surface of accumulator body having leg of gauge resting on servo stem (Fig. 31).

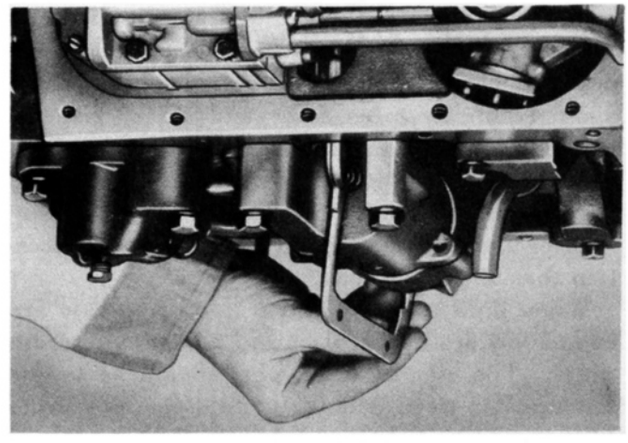


FIGURE 31—*Adjusting Rear Band.*

Back off adjusting screw until face of actuating lever is well away from face of gauge.

Tighten band adjusting screw until face of band actuating lever just touches gauge.

CAUTION: *Do not go beyond adjustment. If adjusting screw is accidentally turned beyond adjustment, loosen two or three turns and repeat adjustment.*

Tighten band adjusting screw lock nut securely while holding adjusting screw.

MINOR SERVICES AND REPAIRS

Subject	Page
Fluid Capacity, Draining and Refilling	18
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Rear Bearing Retainer Oil Seal Replacement	19
Front and Rear Servo	20
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Parking Brake Bracket Assembly	32
Governor	32
Rear Oil Pump	35
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FLUID CAPACITY, DRAINING AND REFILLING

Capacity

Eleven (11) quarts of fluid are required to refill the transmission after draining the torus cover and oil pan. Twelve (12) quarts of fluid are required to refill after the transmission has been disassembled and overhauled. Use Hydra-Matic fluid.

Draining and Refilling

The fluid must be drained from both the fluid coupling and the transmission case, after operation, before the fluid has a chance to cool.

Drive car on lift or over pit.

Remove the inspection hole cover in the lower flywheel housing.

Rotate the flywheel until the drain plug is lined up with inspection hole cover. The fluid coupling drain is a hex head pipe plug located near the outer diameter of the torus cover and a $\frac{7}{16}$" six (6) point socket wrench should be used to remove it.

Remove the hex head drain plug at rear of the *transmission* oil pan.

Inspect the oil pan drain plug gasket to ascertain that it will not leak.

When fluid coupling and transmission case are completely drained, replace and tighten both drain plugs. (The oil pan drain plug should be torque tightened 35 to 45 ft lbs. The fluid coupling drain plug should be tightened 6 to 7 ft. lbs.)

Replace inspection hole cover and lower car.

Cover seat to protect upholstery.

Roll back right side of front floor mat to remove inspection hole cover in floor directly over transmission fluid level indicator.

Remove any sand, dirt, or lint from the floor and around the fluid level indicator so that no foreign matter will fall into the transmission when the fluid level indicator is removed.

Remove fluid level indicator and wipe it clean. Clean the fluid level indicator cap air cleaner in solvent.

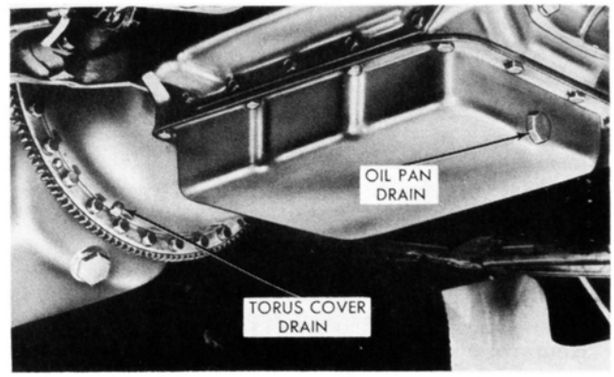


FIGURE 32—*Hydra-Matic Transmission Drain Plugs.*

Pour aproximately 8 quarts of "AQ-ATF" approved Hydra-Matic Fluid into the transmission. *Be sure container, spout, or funnel is clean.*

Set the selector lever in "N" (neutral) position and apply the hand brake. Run the engine at a speed equivalent of 20 MPH for several minutes. This will fill the fluid coupling.

Reduce the engine speed to slow idle (carburetor off fast idle step).

Add sufficient "AQ-ATF" approved fluid to bring the fluid level up to below the "L" mark on the fluid level indicator. Again, run the engine at a speed equivalent to 20 MPH for three (3) minutes to heat the transmission fluid to near its normal operating temperature, which is indicated by a rise in fluid level to near the "F" mark, due to expansion. Reduce engine speed to slow idle and add fluid to bring level to the "F" mark. With engine idling and transmission warm (approximately 150°F), make a final check to be certain the transmission is not overfilled.

CAUTION: *Do not overfill, foaming will result.*

Stop the engine. Replace the fiuid level indicator and floor hole cover.

Return floor mat to its original position and remove cover from seat.

Flushing of the Hydra-Matic Transmission with anything other than "AQ-ATF" approved fluid is not recommended.

Oil Level Under Different Conditions

Oil level as observed on the level indicator will vary as shown in Figures 33, 34, 35, 36, and 37.

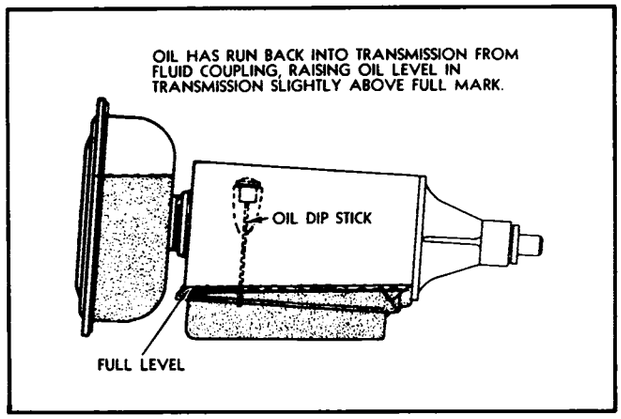


FIGURE 33—*Oil Level, Engine Not Running.*

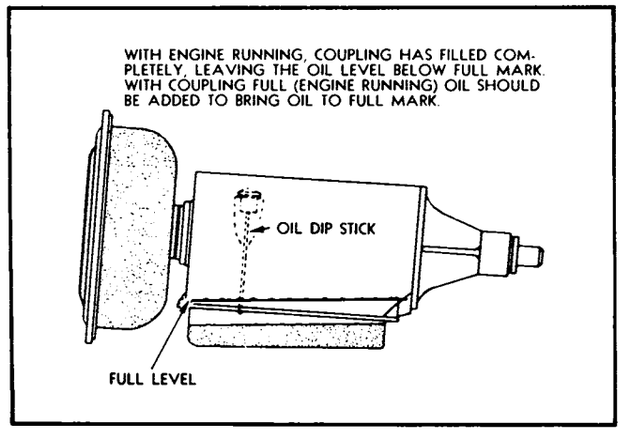


FIGURE 34—*Oil Level, Engine Running.*

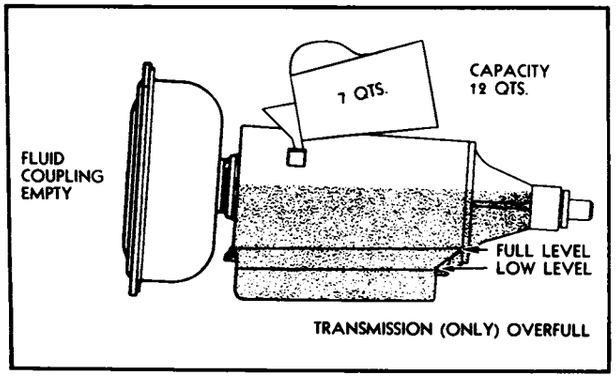


FIGURE 35—*Oil Level, First Seven Quarts Added After Draining Pan and Torus Cover. Engine Not Running.*

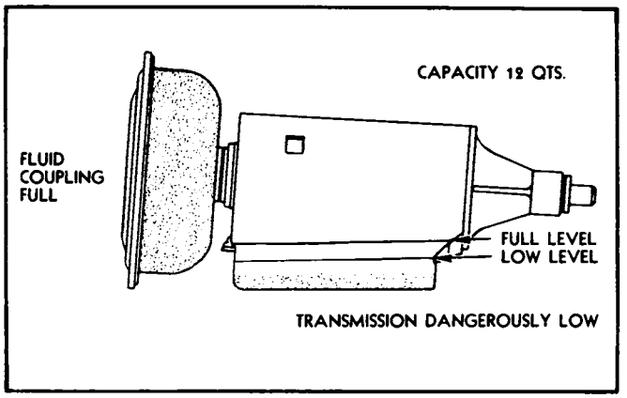


FIGURE 36—*Oil Level, First Seven Quarts Added After Draining Pan and Torus Cover. Engine Running.*

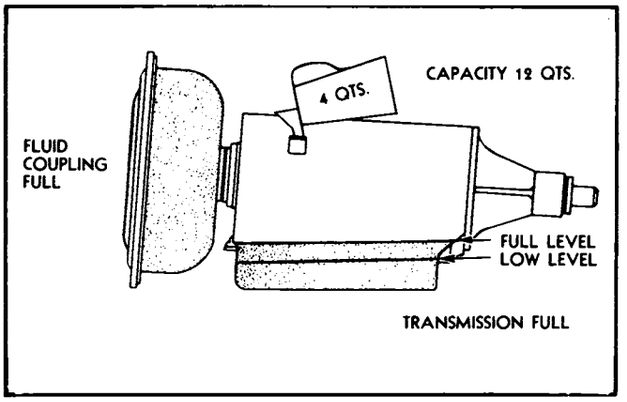


FIGURE 37—*Oil Level, Four Quarts (Approximately) Added to Bring Level to Full Mark.*

TRANSMISSION OIL PAN DRAIN PLUG GASKET

Remove drain plug gasket and inspect oil pan and drain plug for nicks and burrs.

Soak new gasket in water until it is sufficiently pliable to install on drain plug.

CAUTION: *Do not enlarge hole of gasket.*

Install gasket on drain plug and allow it to dry; then replace drain plug in transmission oil pan.

REAR BEARING RETAINER OIL SEAL REPLACEMENT

Place car on stands supporting body at rear of side sills.

Drain Hydra-Matic fluid.

Disconnect the hand brake cable at the bell crank and the brake cable housing at the bell crank bracket.

Disconnect the rear brake hose bracket from floor pan to prevent damage to hose.

Disconnect torque tube from transmission rear bearing retainer, then move rear axle and torque tube assembly to the rear and slide universal joint from transmission output shaft.

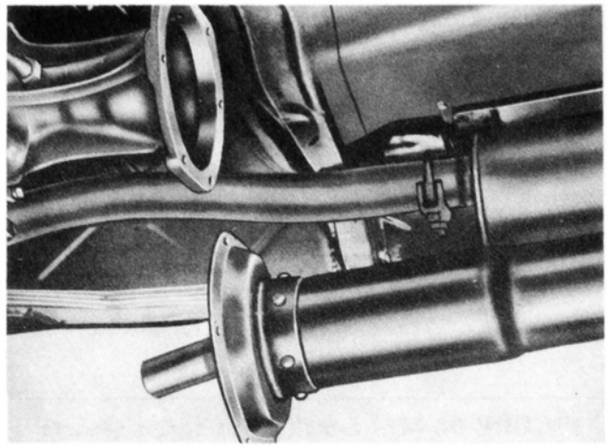


FIGURE 38—*Torque Tube Disconnected From Rear Bearing Retainer.*

Remove the oil seal from the bearing retainer with tool J-4830 oil seal remover and J-2619 slide hammer (Fig. 39).

Inspect bearing retainer seal seat and output shaft for nicks and burrs.

Apply Hydra-Matic fluid to oil seal.

Apply sealing compound (Permatex No. 3 Gasket Cement) to outside of seal.

Install rear bearing retainer oil seal with tool J-1354 (Fig. 40).

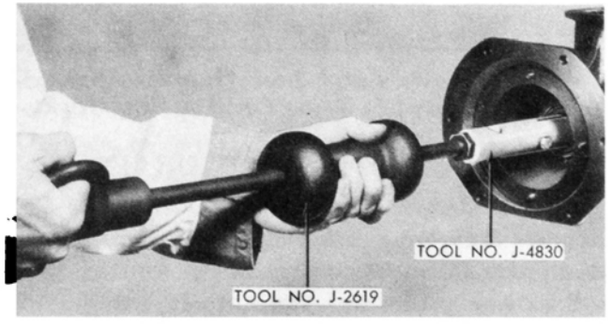


FIGURE 39—*Removing Rear Bearing Retainer Oil Seal.*

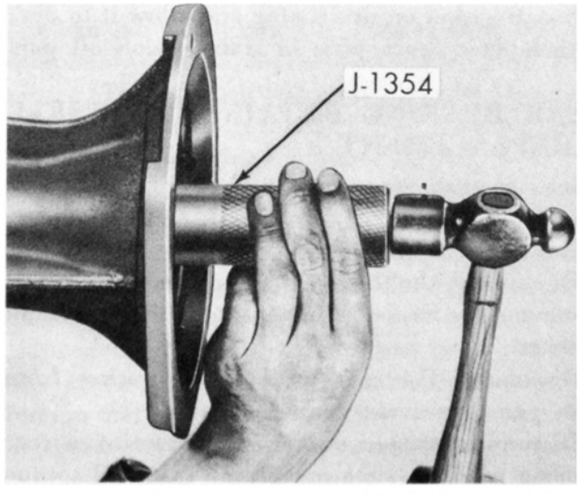


FIGURE 40—*Installing Rear Bearing Retainer Oil Seal.*

Install universal joint, propeller shaft, and torque tube.

Install rear brake hose bracket.

Install hand brake cable and cable housing.

Lower car from stands or hoist.

Inspect and refill the transmission to correct level with Hydra-Matic fluid.

FRONT AND REAR SERVO

Removal

Fold front compartment mat back to uncover band adjusting floor hole cover and remove cover.

Loosen both adjusting band screw lock nuts.

Loosen both band adjusting screws approximately five (5) turns to release servo spring tension.

Place car on stand or hoist and drain transmission oil into clean container.

Remove oil pan and gasket and remove oil pan screen and governor oil delivery pipe (Fig. 41).

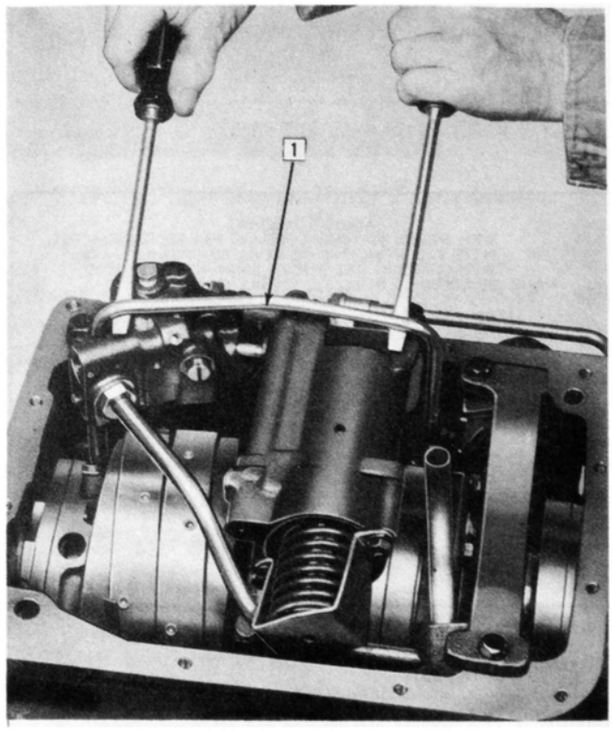


FIGURE 41—*Remove Governor Oil Delivery Pipe.*

Remove front and rear servo attaching bolts; then remove rear servo oil transfer pipe and remove front servo, rear discharge pipe, and front pump delivery pipe.

Front Servo Disassembly

Remove two release cylinders to servo body cap screws and lock washers. Remove release cylinder and front servo spring (Fig. 42).

Remove pipe plug and retainer spring holding 4-3 valve in place and remove valve.

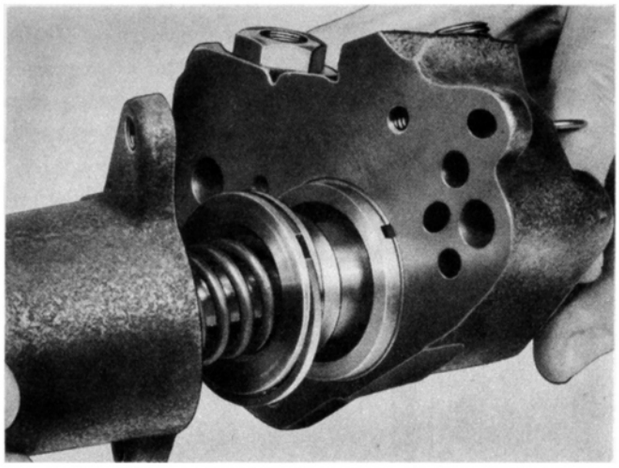


FIGURE 42—*Removing Front Servo Release Cylinder.*

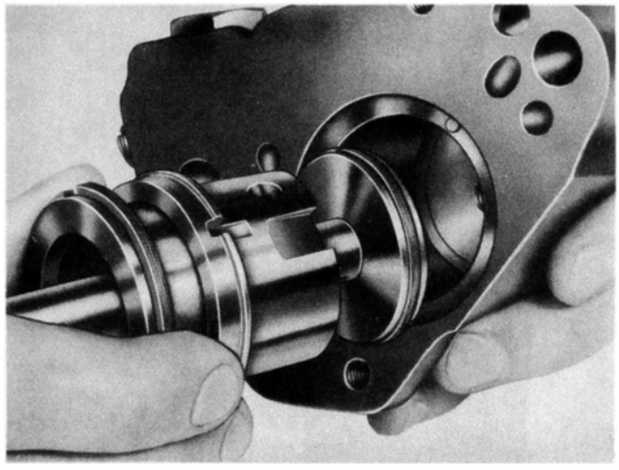
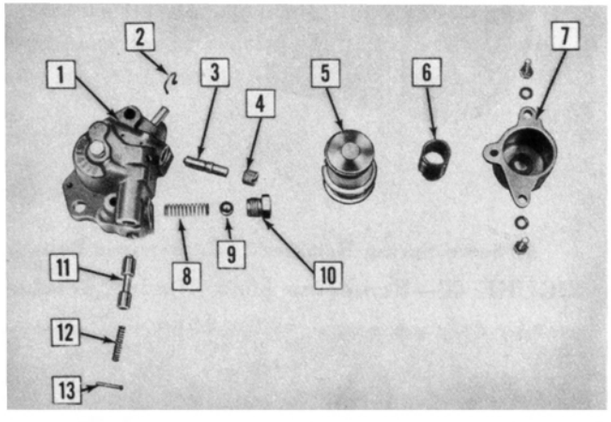


FIGURE 43—*Remove Servo Piston Assembly.*



1. Servo Body
2. 4-3 Valve Retainer
3. 4-3 Valve
4. Plug
5. Servo Piston Assembly
6. Front Servo Spring
7. Release Cylinder
8. Rear Pump Check Valve Spring
9. Rear Pump Check Valve
10. Rear Pump Check Valve Seat
11. Overrun Control Valve
12. Overrun Control Valve Spring
13. Overrun Control Valve Pin

FIGURE 44—*Exploded View of Front Servo.*

Remove rear pump check valve seat, ball and spring.

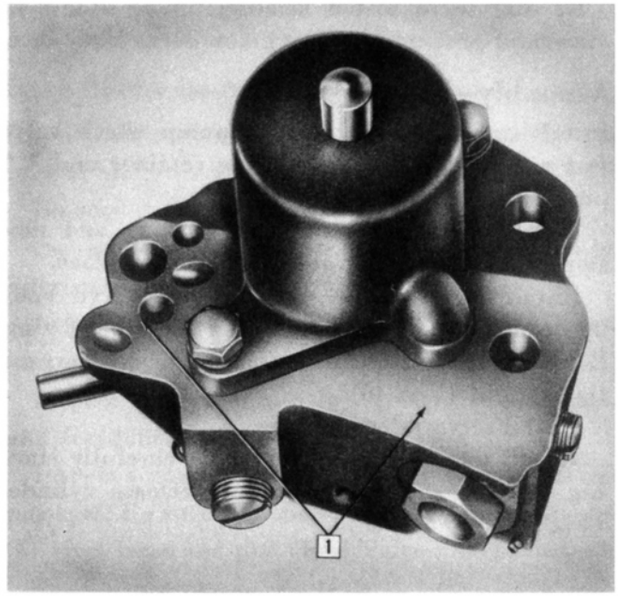
Round off end of overrun control valve pin with a file and remove pin with pliers.

Keep finger over hole in servo body while removing pin to prevent loss of spring, then remove valve (Fig. 44).

Front Servo Inspection

Check face of servo body for roughness or scoring (Fig. 45). Remove any high spots with surface plate and crocus cloth.

Check servo body for blocked or interconnected passages, and inspect front band release cylinder for scores. Remove any high spots on gasket area of release cylinder with surface plate and crocus cloth.



1. Face of Servo Body

FIGURE 45—*Front Servo Assembly.*

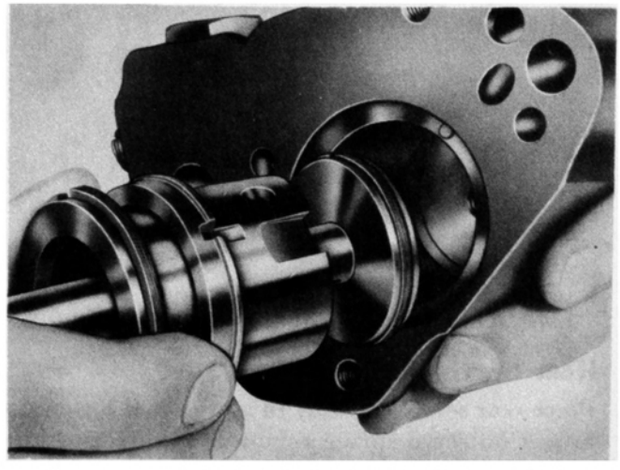


FIGURE 46—*Install Servo Piston Assembly.*

Check front band release piston for scores, broken ring, and freedom of ring in groove.

Check 4-3 valve for freedom in bore and obstructed orifice.

Inspect the front servo spring for distortion or collapsed coils; free length approximately $1\frac{33}{64}$°.

Inspect rear pump check valve seat, ball and spring for damage.

Be sure bleed hole in rear pump check valve seat is drilled.

Be sure overrun control valve is free in its bore and is not scored.

Check free length of overrun control valve spring; free length approximately $1\frac{9}{64}$".

Check to see that compensator piston works freely in its bore within the servo piston assembly.

Be sure two (2) steel plugs sealing oil passages in servo body are in place.

Be sure servo piston locating pin is snugly in place and protrudes to just below servo body face.

Assembly—Front Servo

Install spring, ball, and rear pump check valve seat and install 4-3 valve spring retainer and $\frac{3}{8}$" pipe plug.

Install overrun control valve spring and new stop pin. Peen end of pin to stake it in place.

Install servo piston assembly into servo body by carefully compressing and starting oil seal ring. Be sure groove in piston assembly locates on positioning pin (Fig. 46).

Install servo release spring.

Install servo release cylinder by carefully starting ring on release piston into release cylinder (Fig. 47).

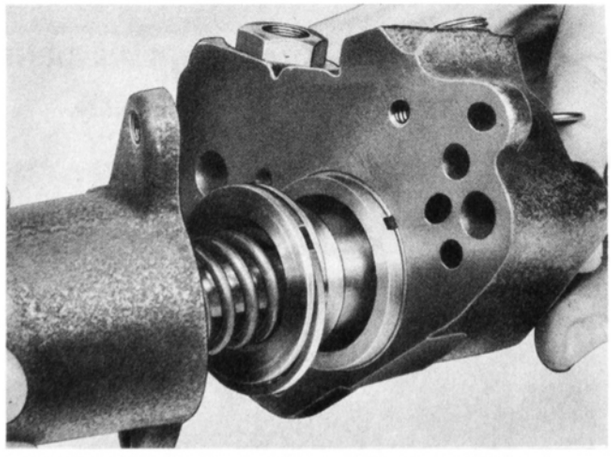
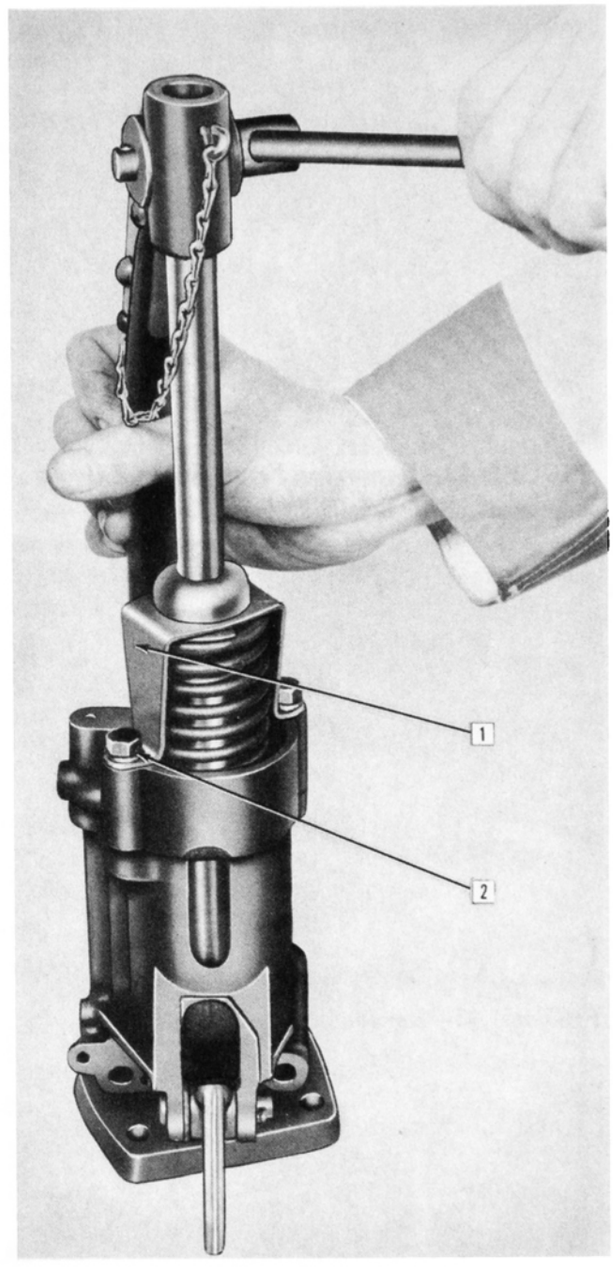


FIGURE 47—*Install Servo Release Cylinder.*

Rear Servo Disassembly

Place rear servo assembly in a press and lower ram to rest on servo spring retainer. Then remove the two retainer to body bolts using $\frac{1}{2}$" end wrench while keeping ram of press against retainer (Fig. 48).



1. Servo Spring Retainer 2. Retainer Bolts

FIGURE 48—*Removing Servo Spring Retainer.*

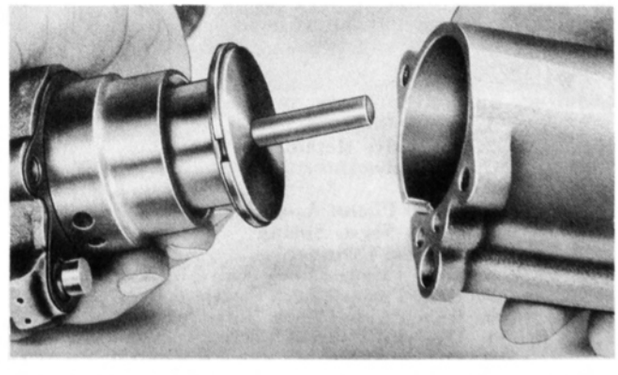


FIGURE 49—*Removing Accumulator Body and Piston Assembly.*

Release press slowly until springs are free; then remove retainer, servo spring, compensator piston, and spring. Remove accumulator body and piston assembly from servo body (Fig. 49).

Place accumulator body on a vise, protecting body on the vise jaws, and tap accumulator piston through accumulator, apply spring and body (Fig. 50).

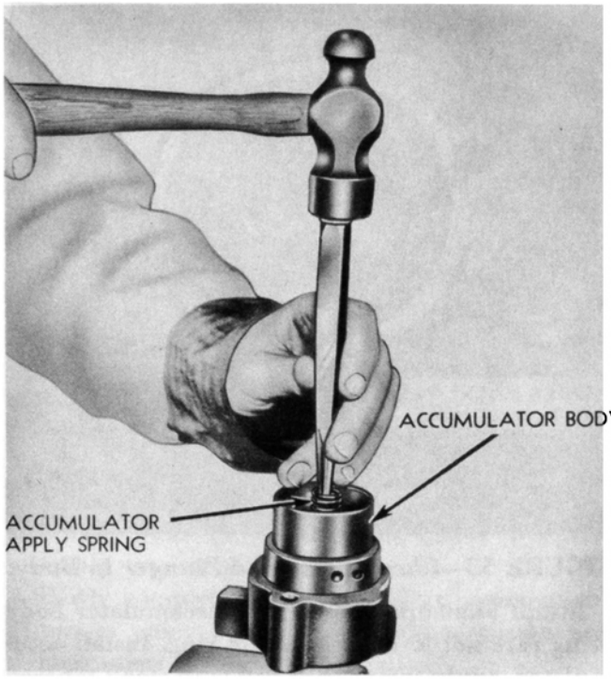


FIGURE 50—*Removing Accumulator Apply Spring.*

Remove booster spring and booster piston from servo body being careful not to cock the piston in bore while removing (Fig. 51).

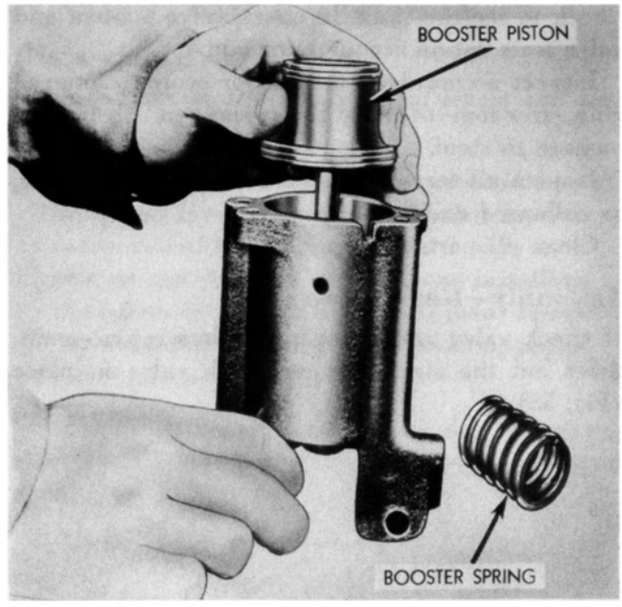


FIGURE 51—*Removing Booster Piston.*

Rear Servo Inspection

Inspect exhaust valve and bore for scores and freeness of valve in bore.

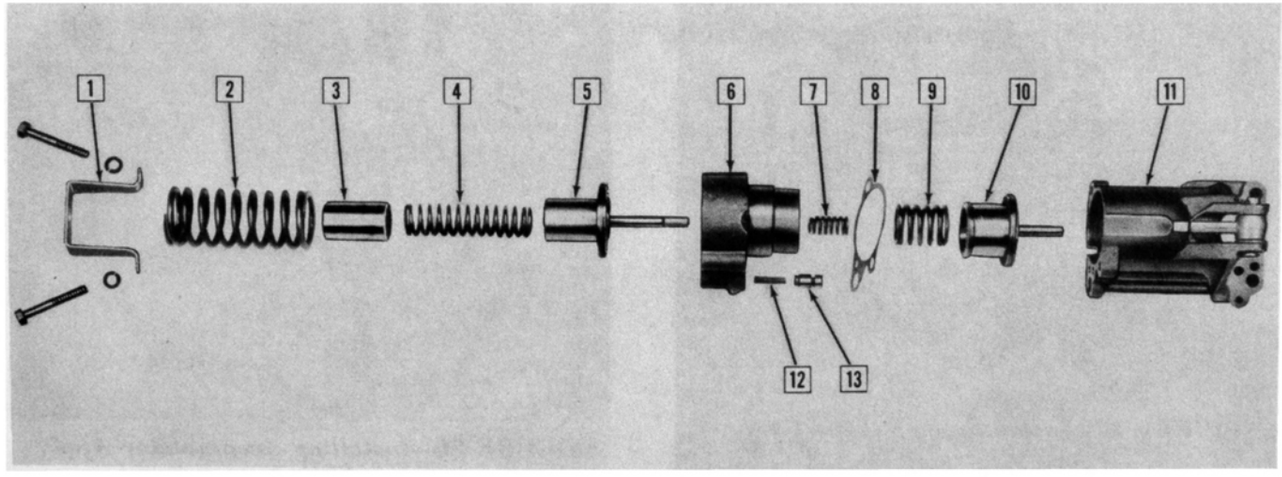
Be sure gasket is not damaged.

Inspect servo body for scores and obstructed or interconnected passages.

Inspect actuating lever for free operation, worn socket, and excessive wear at actuating lever pin.

Inspect booster piston for scores, broken rings, and freedom of rings in grooves.

Inspect accumulator body for scores or obstructed passages. Be sure the check valve is not broken or the rivet loose and that check valve plunger is free.



1. Spring Retainer
2. Rear Servo Spring
3. Compensator Piston
4. Compensator Spring
5. Accumulator Piston
6. Accumulator Body
7. Accumulator Apply Spring
8. Gasket
9. Booster Spring
10. Booster Piston
11. Servo Body
12. Exhaust Valve Spring
13. Exhaust Valve

FIGURE 52—*Exploded View of Rear Servo.*

Check to see that hole in check valve is open and valve seats flat on accumulator body.

Inspect accumulator piston for scores, damaged ring, freedom of ring in groove, or obstructed passage in stem.

Inspect all servo springs for damage, distortion, or collapsed coils.

Clean all parts thoroughly.

Assembly—Rear Servo

If check valve and plunger requires replacement, drive out the rivet holding check valve in place (Fig. 53).

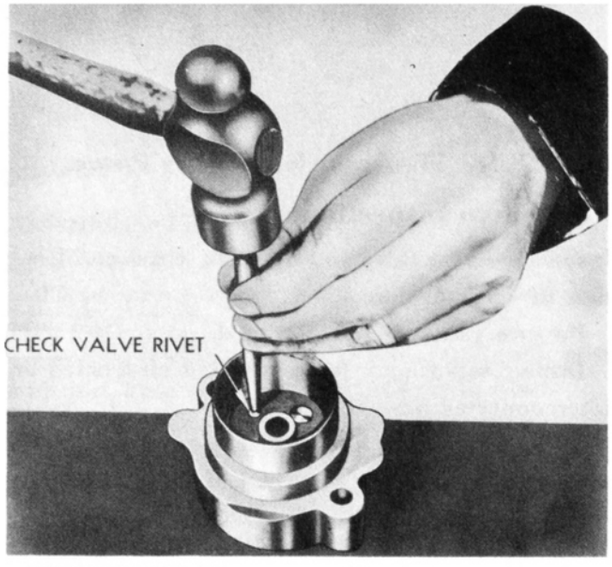


FIGURE 53—*Removing Check Valve Rivet.*

Remove check valve and plunger and clean and inspect body (Fig. 54).

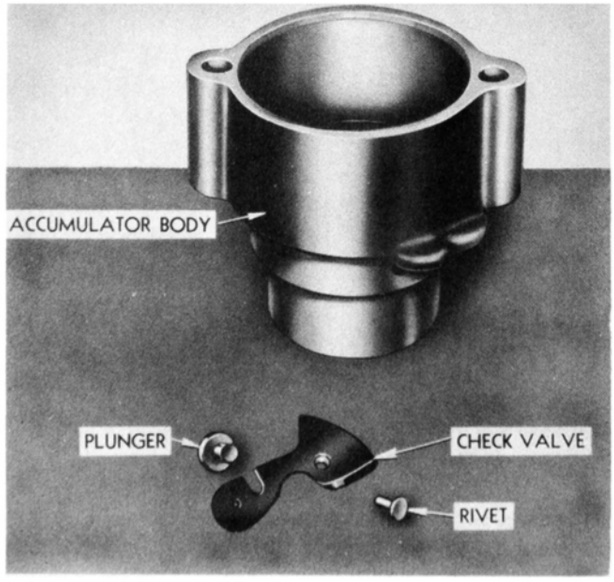


FIGURE 54—*Check Valve, Plunger, and Rivet.*

Install plunger and check valve placing notch in groove in plunger. Insert rivet through valve and body and peen rivet (Fig. 55). Be sure plunger and valve are free.

NOTE: *Small bleed hole in valve should be over hole in body.*

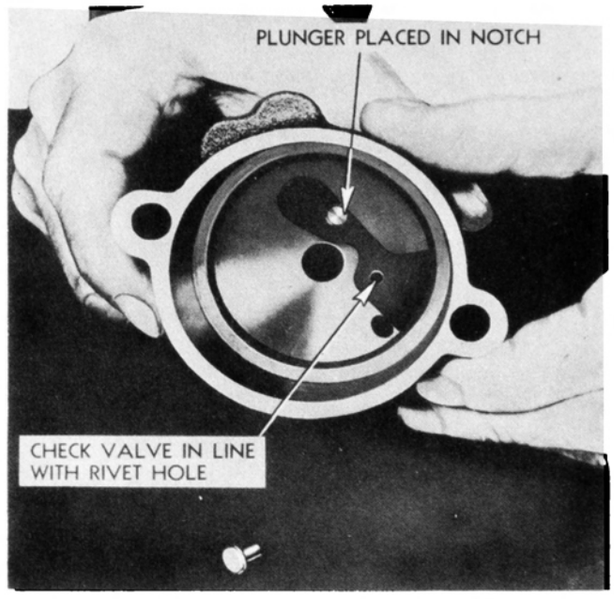


FIGURE 55—*Check Valve and Plunger in Body.*

Install accumulator piston in accumulator body using care not to damage piston ring. Install accumulator, apply spring over rod with small tapered end seating against shoulder (Fig. 56).

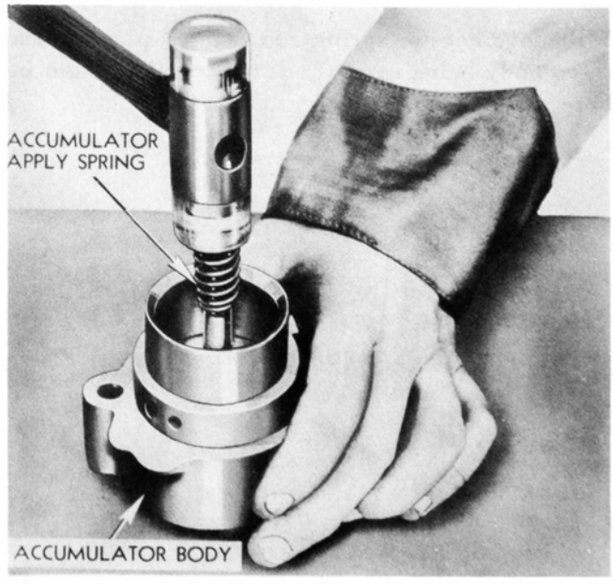
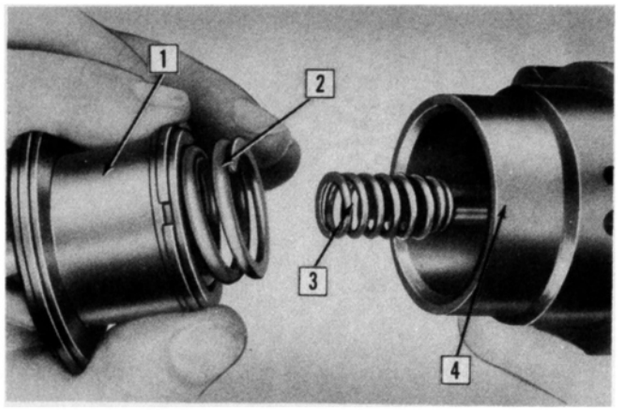


FIGURE 56—*Installing Accumulator Apply Spring.*

Install booster spring in booster piston making sure that spring fits snugly in recess of bottom of booster piston. Install booster piston into accumulator body (Fig. 57).



1. Booster Piston
2. Booster Spring
3. Accumulator Apply Spring
4. Accumulator Body

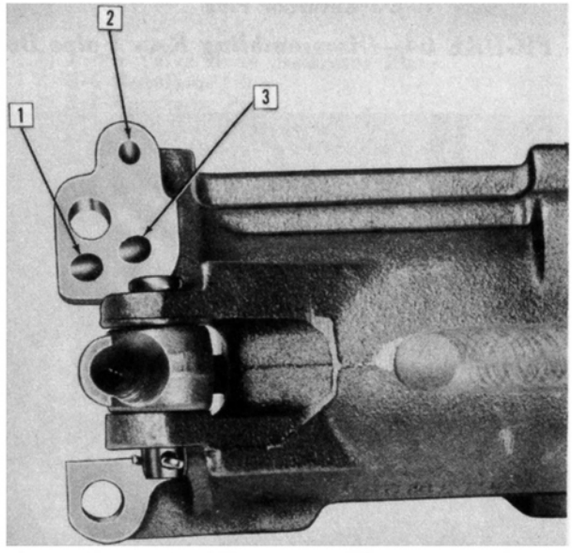
FIGURE 57—*Installing Booster Piston and Spring in Accumulator Body.*

Install accumulator body and piston in servo body using care not to break the ring. Match bosses on accumulator and servo bodies.

Place compensator spring in bore of accumulator piston and install compensator piston over spring. Place servo spring and retainer with the two attaching bolts in position and place complete assembly into press.

Slowly compress spring and align compensator piston to enter bore of accumulator piston and tighten servo spring retainer bolts.

Test operation of rear servo by applying air pressure in the rear band release passage (Fig. 58).



1. Rear Band Release Passage
2. Compensator Passage
3. Manual Low Oil Passage

FIGURE 58—*Oil Passages in Rear Servo.*

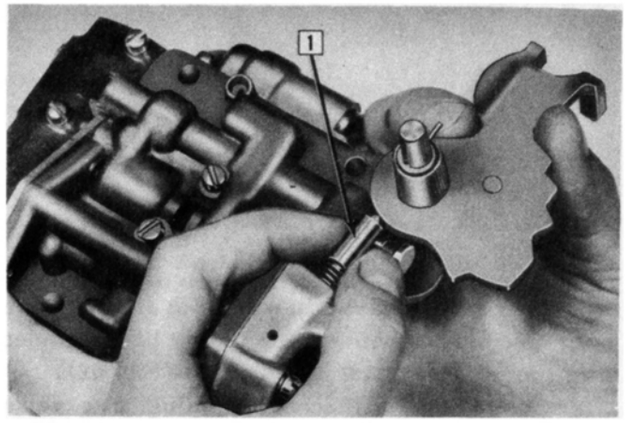
CONTROL VALVE ASSEMBLY

Disassembly

Remove throttle and shift control levers and side pan.

NOTE: *Extreme care must be taken in handling the Hydra-Matic transmission control valve assembly. Never grip the bodies in a vise or use force in removing or installing the valves or plugs. The control valve assembly should be laid on a clean piece of paper for disassembly and assembly.*

Move inside detent control lever slowly counterclockwise to remove detent tension spring and plunger (Fig. 59).

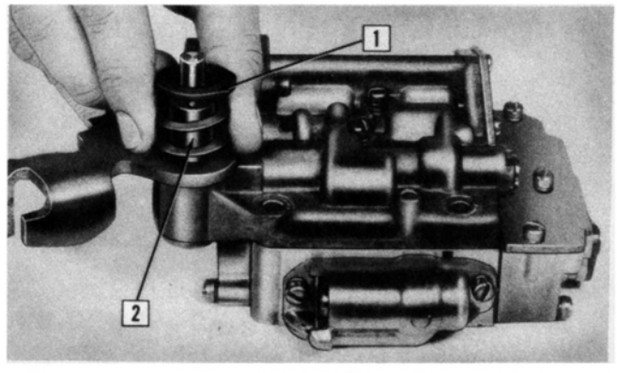


1. Detent Plunger and Spring

FIGURE 59—*Removing Detent Plunger and Spring.*

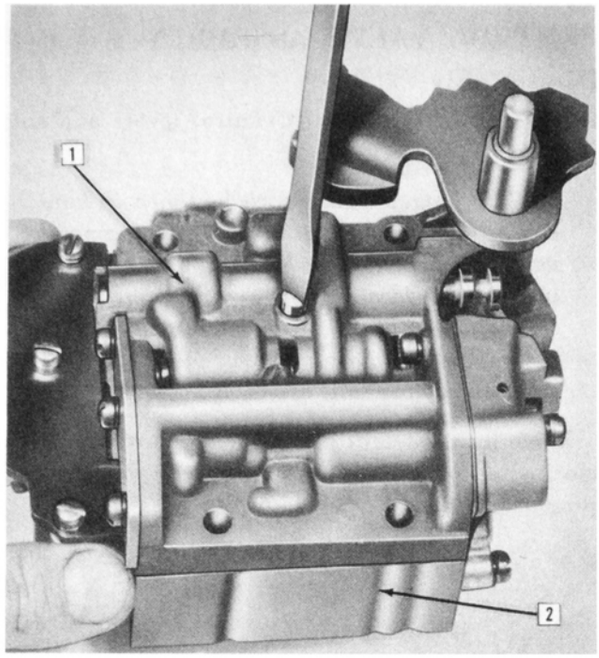
Remove manual shaft rubber seal and outer and inner shaft seal washers (Fig. 60).

Remove two (2) screws holding inner and outer valve bodies together and separate inner and outer valve bodies and spacer plate (Fig. 61).



1. Rubber Seal
2. Seal Washers

FIGURE 60—*Removing Rubber Seal and Washers.*



1. Outer Valve Body
2. Inner Valve Body

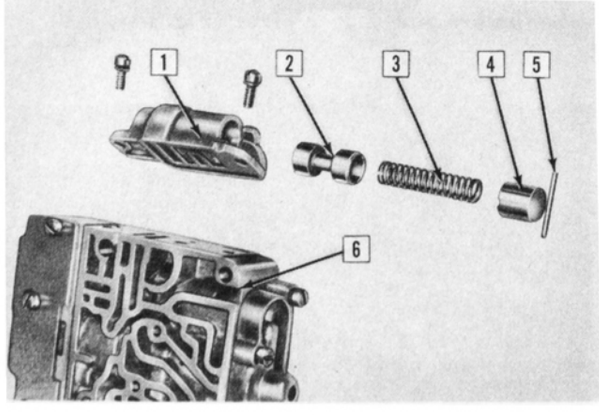
FIGURE 61—*Separate Outer and Inner Valve Bodies.*

Remove two (2) screws and remove timing valve body assembly. Remove timing valve plug retainer pin, timing plug, spring, and valve (Fig. 62).

Remove three (3) screws holding rear valve body assembly to inner valve body, and remove rear valve body and spacer plate (Fig. 63).

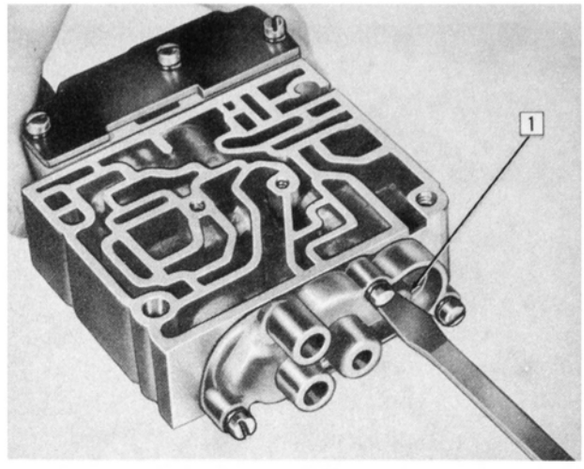
Remove 3-4 governor plug, 2-1 detent plug, 2-1 detent plug spring, and 2-3 governor plug (Fig. 64).

Remove three (3) screws holding front valve body plate to front valve body and remove plate and "T" oil ball check valve and spring (Fig. 65).



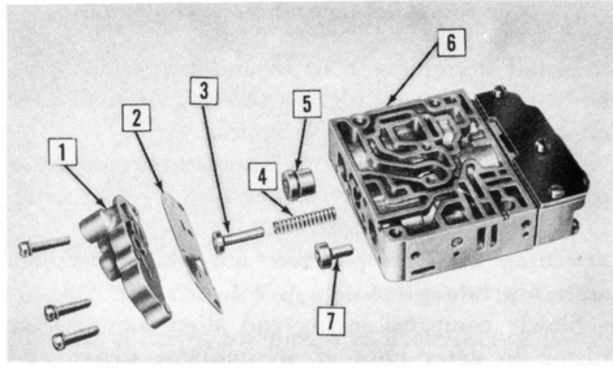
1. Timing Valve Body
2. 3-2 Timing Valve
3. 3-2 Timing Valve Sping
4. 3-2 Timing Valve Plug
5. Plug Retaining Pin
6. Inner Valve Body

FIGURE 62—*Disassembly of Timing Valve Body Assemblies.*



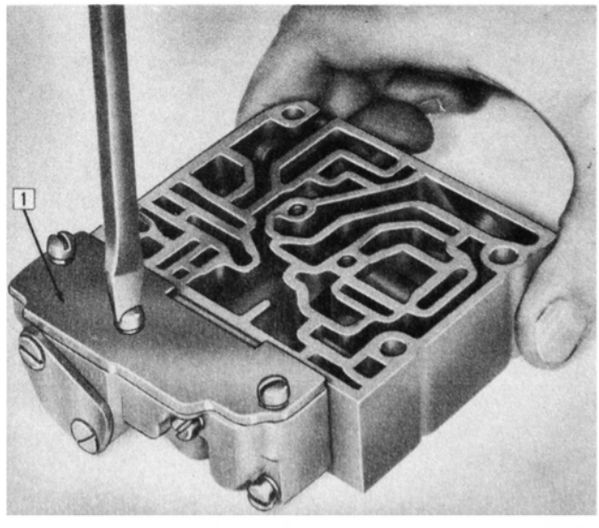
1. Rear Valve Body

FIGURE 63—*Remove Rear Valve Body.*



1. Rear Valve Body
2. Rear Valve Body Spacer Plate
3. 2-1 Detent Plug
4. 2-1 Detent Plug Spring
5. 3-4 Governor Plug
6. Inner Valve Body
7. 2-3 Governor Plug

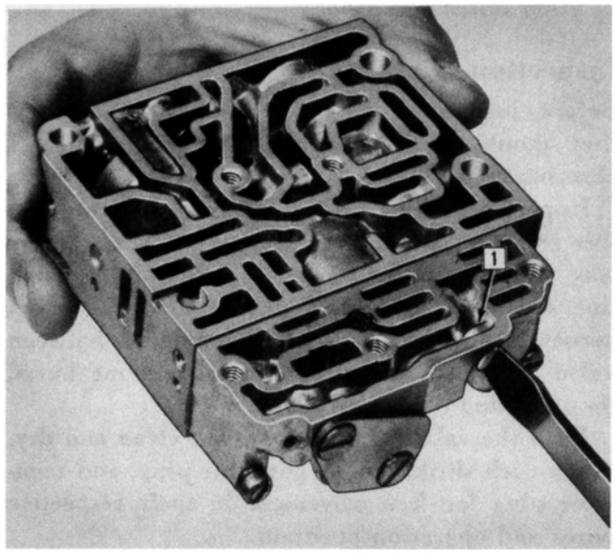
FIGURE 64—*Disassembling Rear Valve Body.*



1. Front Valve Body Plate

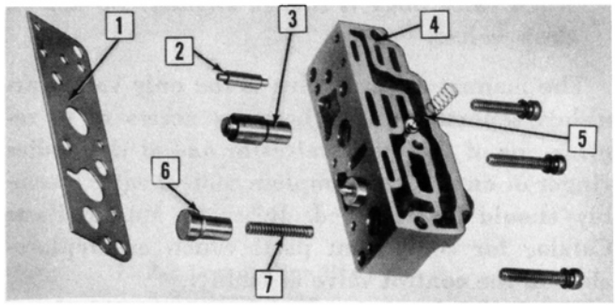
FIGURE 65—*Remove Front Valve Body Plate.*

Remove three (3) screws holding front valve body assembly to inner valve body assembly and remove front valve body assembly and separator plate (Fig. 66).



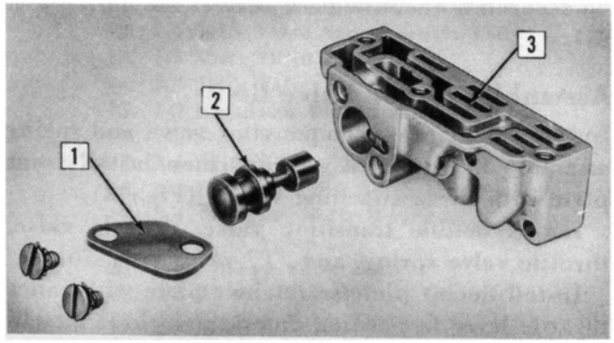
1. Remove Front Valve Body

FIGURE 66—*Removing Front Valve Body Assembly.*



1. Front Valve Body Separator Plate
2. 3-4 Regulator Plug
3. 1-2 Regulator Plug
4. Front Valve Body
5. "T" Oil Ball Check Valve and Spring
6. T.V. Regulator Valve
7. T.V. Regulator Valve Spring

FIGURE 67—*Disassembly of Front Valve Body.*



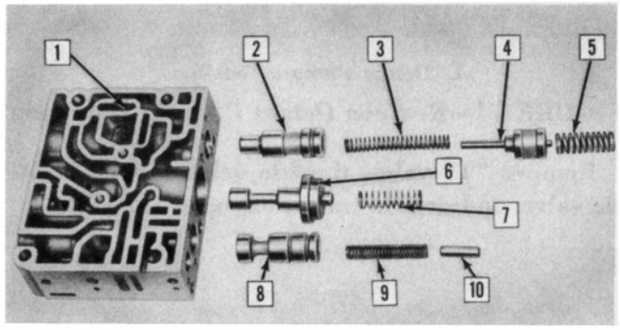
1. 3-2 Detent Plug Plate
2. 3-2 Detent Plug
3. Front Valve Body

FIGURE 68—*Location of 3-2 Detent Plug.*

Remove 3-4 regulator plug, 1-2 regulator plug, T.V. regulator valve and spring from front body (Fig. 67).

Remove two (2) screws and 3-2 detent plug plate and remove 3-2 detent plug from front valve body (Fig. 68).

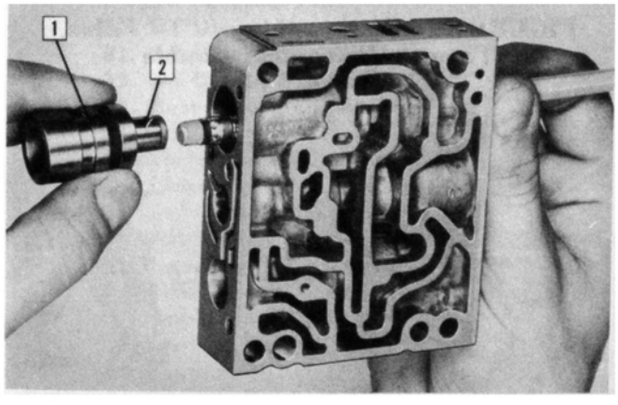
Remove 3-4 shift valve spring, 3-4 lockout valve assembly, 3-4 auxiliary shift spring, 3-4 shift valve, 1-2 regulator plug spring, 1-2 shift valve, 2-3 shift valve spring, 2-3 spring guide pin, and 2-3 shift valve (Fig. 69).



1. Inner Valve Body
2. 3-4 Shift Valve
3. 3-4 Auxiliary Shift Spring
4. 3-4 Lockout Valve Assembly
5. 3-4 Shift Valve Spring
6. 1-2 Shift Valve
7. 1-2 Regulator Plug Spring
8. 2-3 Shift Valve
9. 2-3 Shift Valve Spring
10. 2-3 Shift Valve Spring Guide

FIGURE 69—*Disassembly of Shift Valves and Springs From Inner Valve Body.*

Remove 2-3 governor sleeve and 2-3 auxiliary valve by pushing out with a pencil or small rod (Fig. 70).

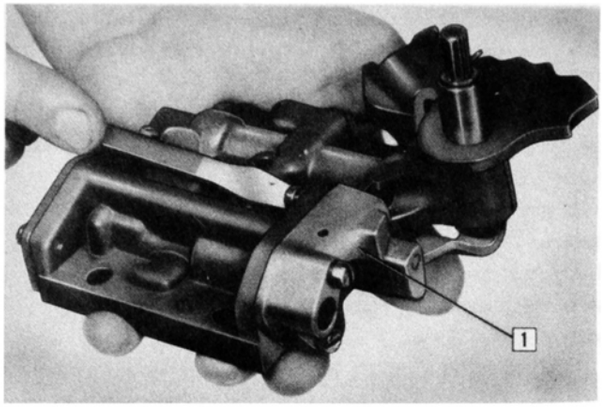


1. 2-3 Governor Sleeve
2. 2-3 Auxiliary Valve

FIGURE 70—*Removing 2-3 Governor Sleeve and Auxiliary Valve.*

Outer Valve Body

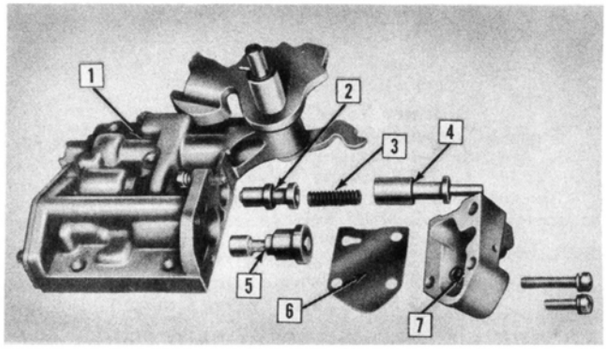
Remove manual valve, then remove three (3) screws from detent plunger retainer and remove retainer and plate (Fig. 71).



1. Detent Plunger Retainer

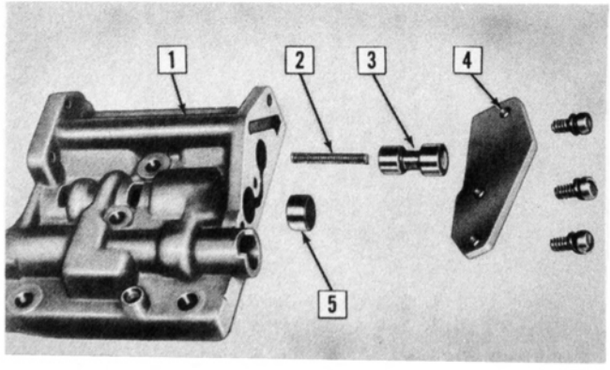
FIGURE 71—*Remove Detent Plunger Retainer.*

Remove "T" valve, throttle valve spring, throttle valve, and double transition valve (Fig. 72).



1. Outer Valve Body
2. Throttle Valve
3. Throttle Valve Spring
4. "T" Valve
5. Double Transition Valve
6. Detent Plunger Retainer Plate
7. Detent Plunger Retainer

FIGURE 72—*Disassembly of "T" Valve, Throttle Valve, and Double Transition Valve.*



1. Outer Valve Body
2. Compensator Valve Spring
3. Compensator Valve
4. Outer Valve Body Front Plate
5. Detent Plug

FIGURE 73—*Remove Outer Valve Body Plate, Compensator Valve, and Detent Plug.*

Remove three (3) screws and outer valve body front plate and remove compensator valve spring and detent plug (Fig. 73).

NOTE: *Do not remove compensator pin from outer valve body.*

Inspection—Control Valve

Before inspecting the valve bodies and valves, they should be thoroughly cleaned with CLEAN cleaning fluid.

Inspect all valves carefully to see that they are free from burrs and not damaged (scored) in any way. Burrs can be removed by carefully using fine crocus cloth. This type of valve has sharp corners to prevent dirt from wedging between valve and body, therefore, when removing burrs, do not round off square edges.

With the valves and valve bodies clean and dry, check each shifter valve, governor plug, and regulator plug for free movement in their respective bores and operation positions.

NOTE: *Valves can be assumed to be free in their operating position if they will fall of their own weight in their respective bores when valve body is shaken slightly. Do not drop valves.*

The manual control valve is the only valve furnished separately. If it becomes necessary to replace one of the other valves or one of the bodies (inner or outer), the complete control valve assembly should be replaced. Refer to Master Parts Catalog for component parts which are replaceable on the control valve assembly.

Check the fit of the throttle valve inside lever and shaft in the hub of the inside detent control lever on the outer valve body. If the shaft binds in the hub, is excessively worn, or if the oil seal is missing or damaged, it will be necessary to replace the defective parts.

Before reassembly, make certain the springs can be accurately identified for correct assembly (Fig. 75).

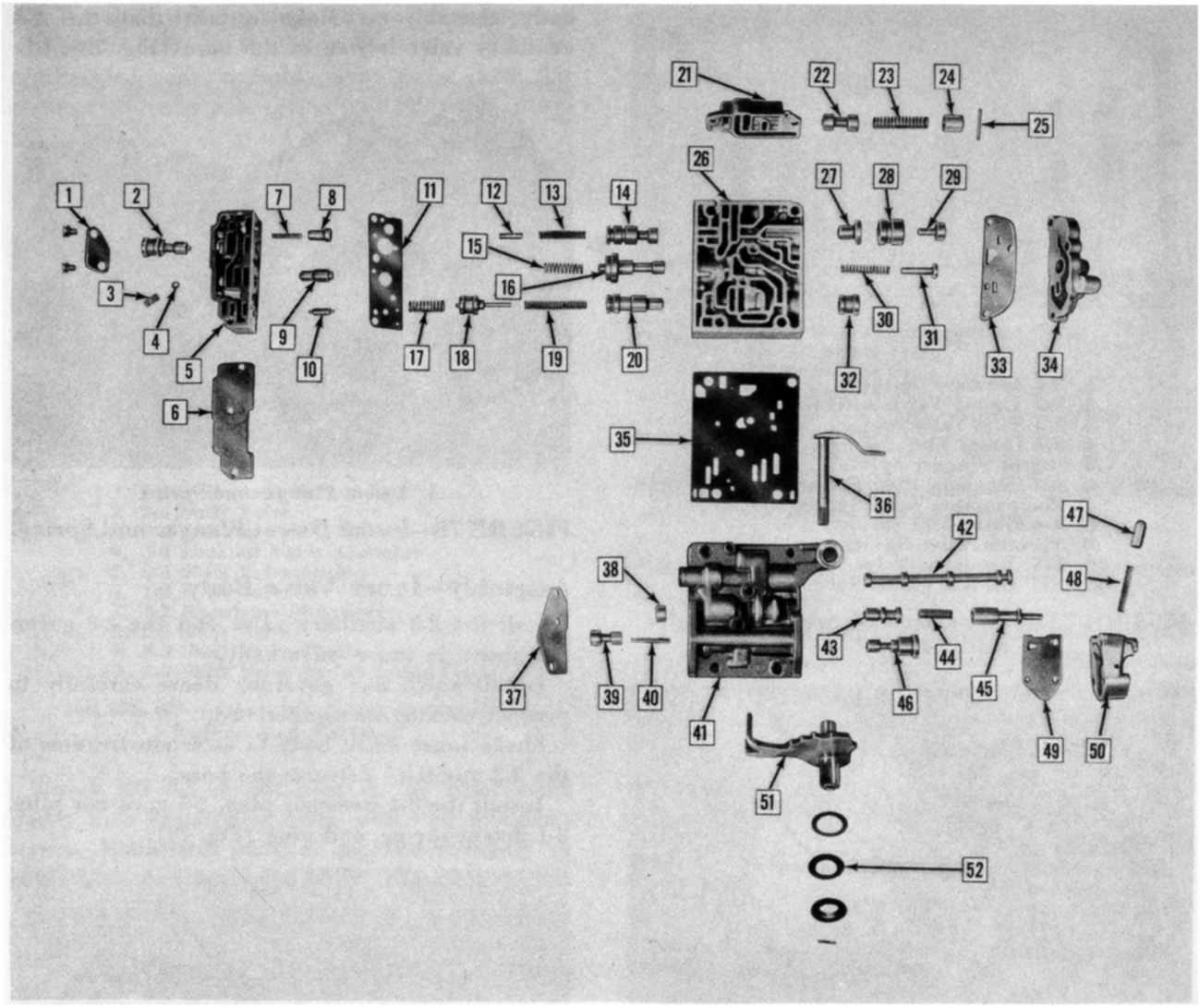
Assembly—Outer Valve Body

Install detent plug, compensator valve and spring assembly in outer valve body; then install front plate with three attaching screws (Fig. 73).

Install double transition valve, throttle valve, throttle valve spring, and "T" valve (Fig. 76).

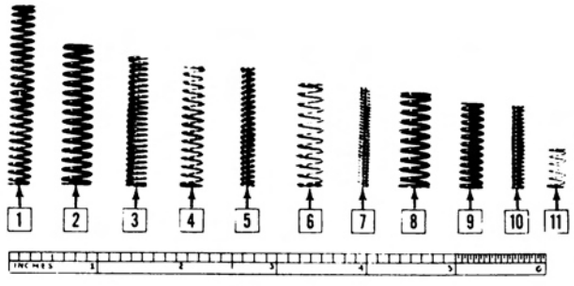
Install detent plunger retainer plate with inner throttle lever in position and tighten three attaching screws (Fig. 77).

Install manual valve, detent spring and plunger. Align manual valve with the inside detent control lever, and rotate clockwise to index inner valve



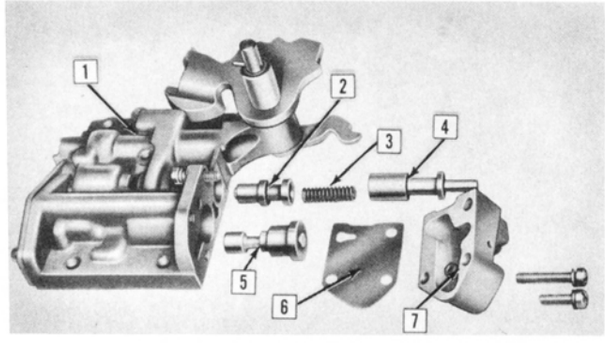
1. 3-2 Detent Plug Plate
2. 3-2 Detent Plug
3. "T" Oil Ball Check Valve Spring
4. "T" Oil Ball Check Valve
5. Front Valve Body
6. Front Valve Body Plate
7. T.V. Regulator Valve Spring
8. T.V. Regulator Valve
9. 1-2 Regulator Plug
10. 3-4 Regulator Plug
11. Front Valve Body Separator Plate
12. 2-3 Shift Valve Spring Guide Pin
13. 2-3 Shift Valve Spring
14. 2-3 Shift Valve
15. 1-2 Regulator Plug Spring
16. 1-2 Shift Valve
17. 3-4 Shift Valve Spring
18. 3-4 Lockout Valve Assembly
19. 3-4 Auxiliary Shift Spring
20. 3-4 Shift Valve
21. 3-2 Timing Valve Body
22. 3-2 Timing Valve
23. 3-2 Timing Valve Spring
24. 3-2 Timing Valve Plug
25. 3-2 Timing Valve Plug Retainer Pin
26. Inner Valve Body
27. 2-3 Auxiliary Valve
28. 2-3 Governor Sleeve
29. 2-3 Governor Plug
30. 2-1 Detent Plug Spring
31. 2-1 Detent Plug
32. 3-4 Governor Plug
33. Rear Valve Body Spacer Plate
34. Rear Valve Body
35. Valve Body Spacer Plate
36. Inner Throttle Lever
37. Outer Valve Body Front Plate
38. Detent Plug
39. Compensator Valve
40. Compensator Valve Spring
41. Outer Valve Body
42. Manual Control Valve
43. Throttle Valve
44. Throttle Valve Spring
45. "T" Valve
46. Double Transition Valve
47. Detent Plunger
48. Detent Plunger Spring
49. Detent Plunger Retainer Plate
50. Detent Plunger Retainer
51. Manual Shaft and Detent Control Lever
52. Rubber Seals and Washers

FIGURE 74—*Disassembled View of Control Valve Assembly.*



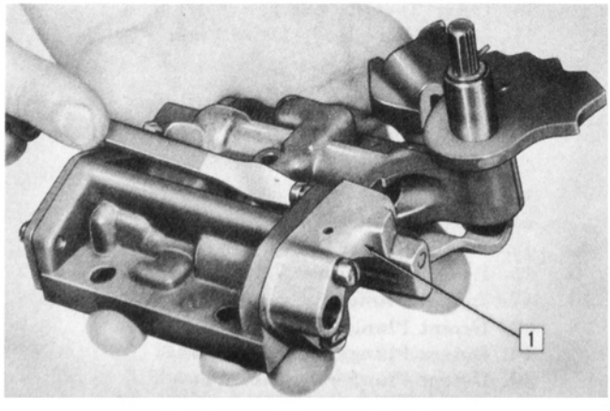
1. 3-4 Auxiliary Spring
2. 3-2 Timing Valve Spring
3. 2-3 Shift Valve Spring
4. 2-1 Detent Plug Spring
5. Detent Plunger Spring
6. 1-2 Regulator Plug Spring
7. Compensator Valve Spring
8. 3-4 Shift Valve Spring
9. Throttle Valve Spring
10. T.V. Regulator Valve Spring
11. "T" Oil Ball Check Valve Spring

FIGURE 75—*Comparison of Springs in Valve Body Assembly.*



1. Outer Valve Body
2. Throttle Valve
3. Throttle Valve Spring
4. "T" Valve
5. Double Transition Valve
6. Detent Plunger Retainer Plate
7. Detent Plunger Retainer

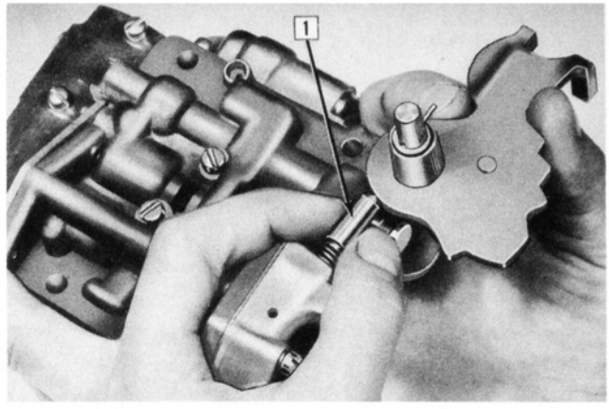
FIGURE 76—*Install "T" Valve and Throttle Valve.*



1. Detent Plunger Retainer

FIGURE 77—*Installing Detent Plunger Retainer.*

body assembly to make certain that the 2-3 auxiliary valve is free in the bore (Fig. 78).



1. Detent Plunger and Spring

FIGURE 78—*Install Detent Plunger and Spring.*

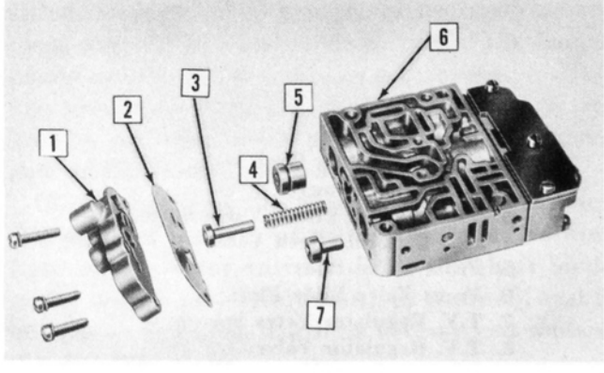
Assembly—Inner Valve Body

Install the 2-3 auxiliary valve and the 2-3 governor sleeve in inner valve body.

Install valve and governor sleeve carefully to prevent cocking in counterbore.

Shake inner valve body to ascertain freeness of the 2-3 auxiliary valve in the bore.

Install the 3-4 governor plug, 2-3 governor plug, 2-1 detent spring, and plug (Fig. 79).



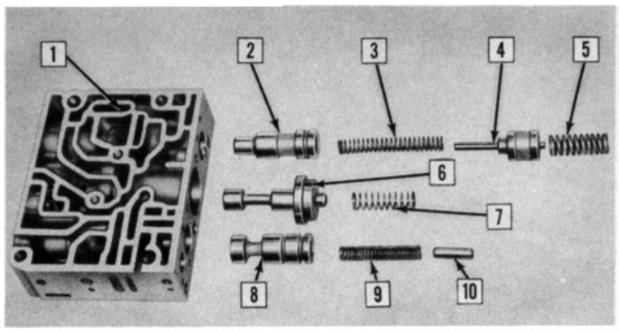
1. Rear Valve Body
2. Rear Valve Body Spacer
3. 2-1 Detent Plug
4. 2-1 Detent Plug Spring
5. 3-4 Governor Plug
6. Inner Valve Body
7. 2-3 Governor Plug

FIGURE 79—*Install Governor Plugs, Detent Spring, and Plug.*

Install the rear valve body assembly and spacer plate. The detent plug can be held in position with the plate while starting the three attaching screws.

Install the 2-3 shift valve, spring, and spring guide pin, 1-2 shift valve and regulator plug spring, the 3-4 shift valve, and 3-4 auxiliary shift valve spring. Then install the 3-4 lockout valve

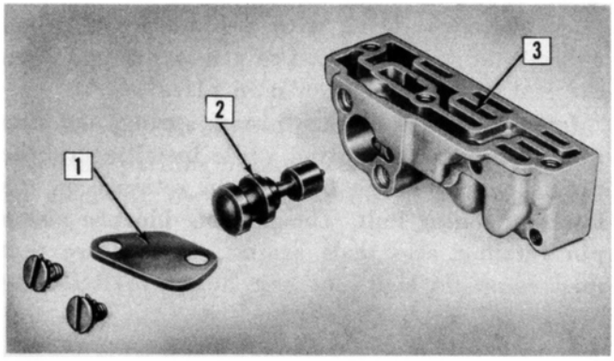
and 3-4 shift valve spring. The valve and spring will protrude from the bore. However, with the inner valve body assembly lying on a clean flat surface, the valve and spring will remain in place (Fig. 80).



1. Inner Valve Body
2. 3-4 Shift Valve
3. 3-4 Auxiliary Shift Spring
4. 3-4 Lockout Valve Assembly
5. 3-4 Shift Valve Spring
6. 1-2 Shift Valve
7. 1-2 Regulator Plug Spring
8. 2-3 Shift Valve
9. 2-3 Shift Valve Spring
10. 2-3 Shift Valve Spring Guide Pin

FIGURE 80—*Assembly Sequence of Shift Valves and Springs.*

Install the 3-2 detent plug in the front valve body; then install the plate with two attaching screws. Make sure plate is installed correctly to cover bore in front valve body (Fig. 81).

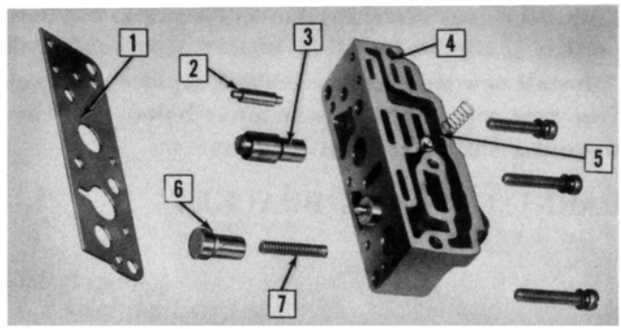


1. 3-2 Detent Plug Plate
2. 3-2 Detent Plug
3. Front Valve Body

FIGURE 81—*Install Detent Plug in Front Valve Body.*

Install T.V. regulator valve and spring in front valve body and install the 1-2 and 3-4 regulator plugs. Install separator plate with three attaching screws (Fig. 82).

With the front valve body and inner valve body assemblies on a clean flat surface, bring the two together and start the 3-4 lockout valve into the inner valve body before starting the attaching screws. Be sure that all springs line up with the respective valves and bores. Install and tighten the

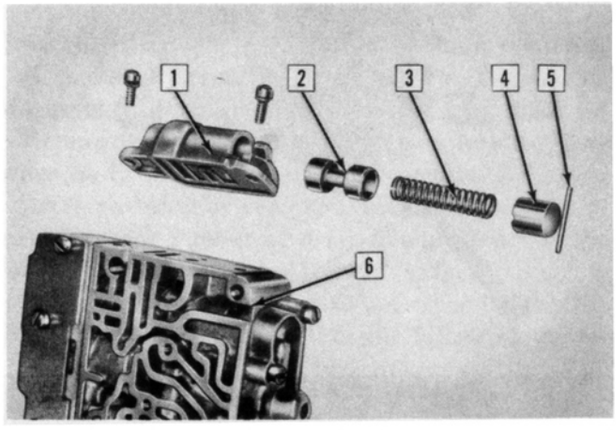


1. Front Valve Body Separator Plate
2. 3-4 Regulator Plug
3. 1-2 Regulator Plug
4. Front Valve Body
5. "T" Oil Ball Check Valve and Spring
6. T.V. Regulator Valve
7. T.V. Regulator Valve Spring

FIGURE 82—*Install Regulator Valve and Plugs in Front Valve Body.*

three attaching screws alternately to bring the two valve bodies together evenly.

Install the 3-2 timing valve, spring, and plug into the 3-2 timing valve body. Press plug into bore to compress the spring and insert the plug retainer pin. Install timing valve assembly on inner valve body with two attaching screws (Fig. 83).



1. Timing Valve Body
2. 3-2 Timing Valve
3. 3-2 Timing Valve Spring
4. 3-2 Timing Valve Plug
5. Plug Retainer Pin
6. Inner Valve Body

FIGURE 83—*Install Timing Valve Assembly.*

Install spacer plate and outer valve body on inner valve body assembly. With the four control valve to transmission case attaching bolts, line up both inner and outer valve body assemblies before tightening and install and tighten the two attaching screws.

Install manual shaft, inner and outer washers, and rubber seal.

Install control valve assembly to transmission case. Line up the oil delivery pipes to rear valve body; then position the control valve assembly and

install the four attaching bolts. Torque to 6-8 foot pounds.

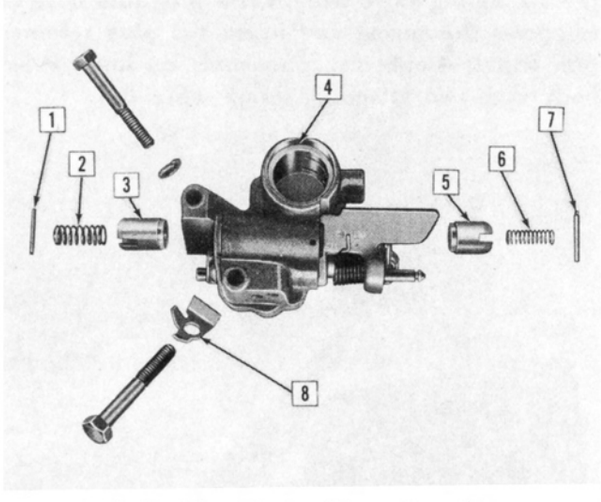
Install new side pan gasket and replace side pan (use new copper washers at lower bolts). Replace the outer shift and throttle levers.

PARKING BRAKE BRACKET ASSEMBLY

After the side pan and control valve assembly has been removed, remove the parking pawl pivot bolt and lower the parking pawl in case. Then remove the parking brake bracket bolts and remove the assembly by pulling it off of the governor.

Remove parking blocker stop pin with needle nose pliers while holding finger over blocker piston spring; remove spring and piston.

Remove reverse blocker stop pin by chipping or filing end of pin. Position hand over piston bore while removing pin in order to prevent loss of spring. Remove reverse blocker piston and springs (Fig. 84).



1. Parking Blocker Piston Stop Pin
2. Parking Blocker Piston Spring
3. Parking Blocker Piston
4. Parking Blocker Bracket
5. Reverse Blocker Piston
6. Reverse Blocker Piston Spring
7. Reverse Blocker Piston Pin
8. Reverse Blocker Stop Pin Retainer

FIGURE 84—*Parking Brake Bracket Assembly.*

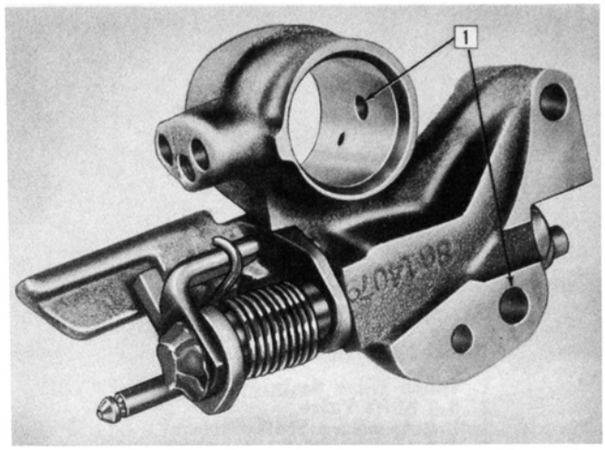
Inspection

Inspect blocker piston and their bores for scores or burrs. Check freeness of pistons in bores.

Inspect springs for distortion or collapsed coils. Check to see that both ¼" plugs are in place in the drilled blocker piston passages. Be sure that the center hole in the governor oil delivery sleeve is plugged with a ¼" plug.

Using a tag wire, check the feed to governor passage to be sure it is open.

Insert a tag wire through the small G-1 blocker piston passage in the governor oil delivery sleeve and look for the wire through the reverse blocker piston bore (Fig. 85).



1. Location of Governor Oil Feed Passage

FIGURE 85—*Parking Brake Bracket Assembly Oil Passage.*

Inspect governor oil delivery sleeve for scoring or signs of extreme wear. Be sure that the parking brake pawl crank is securely welded in place.

Check to see that the reverse lever return spring dowel is securely fastened to the reverse lever.

Assembly

Install the reverse blocker piston, spring, and stop pin. Compress spring with a blunt screw driver while installing the pin. Use a new pin and peen the end in order to keep it in place.

Install parking blocker piston, spring, and stop pin. Compress this spring while installing it; the pin is held in place by the pin retainer on the lower attaching bolt. The parking blocker piston pin retainer also seals against oil pressure that may come through the bolt hole and locks the bracket to case bolt in place.

GOVERNOR ASSEMBLY

Removal

Place car on stands or hoist.

Remove oil pan drain plug; drain fluid into a clean container. Remove throttle lever, shift control lever, and side cover and gaskets. Remove oil pan, oil screen, and front intake pipe.

Position inner detent control lever in "L" range position and remove the four bolts from the control valve assembly. Move the assembly toward the front lifting it clear of the governor and reverse oil delivery pipes. Wrap control valve assembly in a clean rag and set aside to prevent damage.

Bend the lip on the parking blocker piston pin retainer on the lower bolt (Fig. 86).

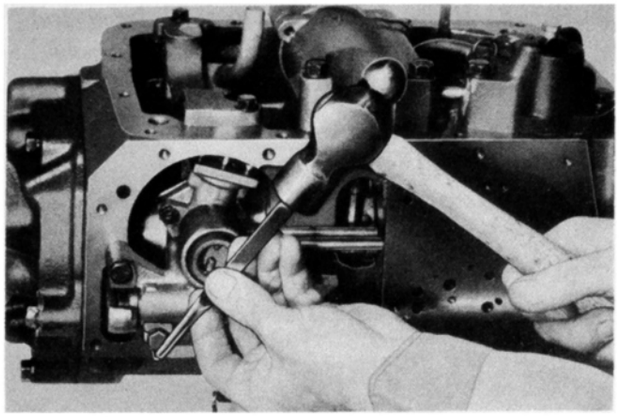


FIGURE 86—*Parking Blocker Piston Pin Retainer.*

Remove parking pawl pivot bolt and lower parking pawl in case as it cannot be removed at this time (Fig. 87).

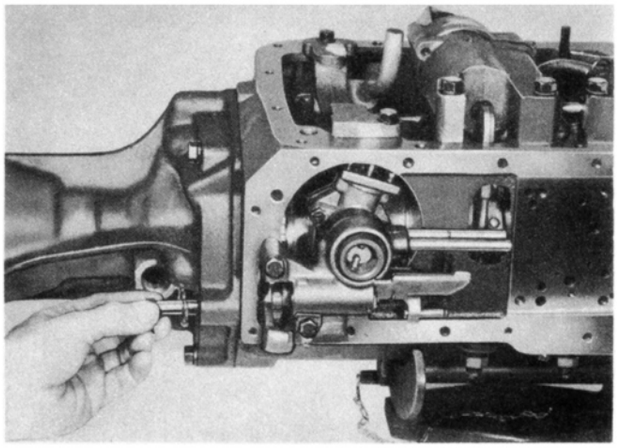


FIGURE 87—*Remove Parking Pawl Pivot Bolt.*

Remove parking brake bracket bolts and remove the assembly by pulling it off of the governor (Fig. 88).

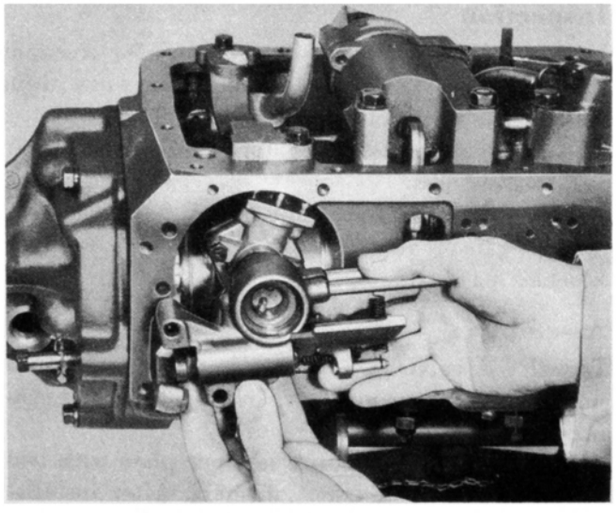


FIGURE 88—*Remove Parking Brake Bracket Assembly.*

Mount dial indicator on side of transmission and check governor runout at tower about ¼" from the end of the governor (Fig. 89).

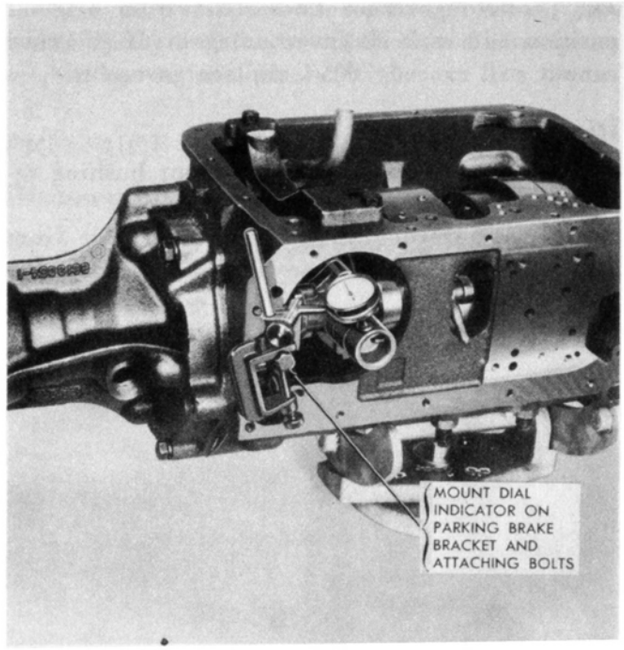


FIGURE 89—*Checking Governor Runout.*

Rotate the shaft several revolutions and note runout which should not exceed .005" limit. If limit is within .005", no further check is required.

If governor runout exceeds .005", mark position of governor body on rear oil pump drive flange.

Remove two bolts and lock washers holding governor body to drive flange and remove governor.

After governor is removed, relocate dial indicator and check runout of drive flange. Drive flange runout should not exceed .002" (Fig. 90).

If the runout exceeds .002", correct the condition by replacing one or all of the following parts:

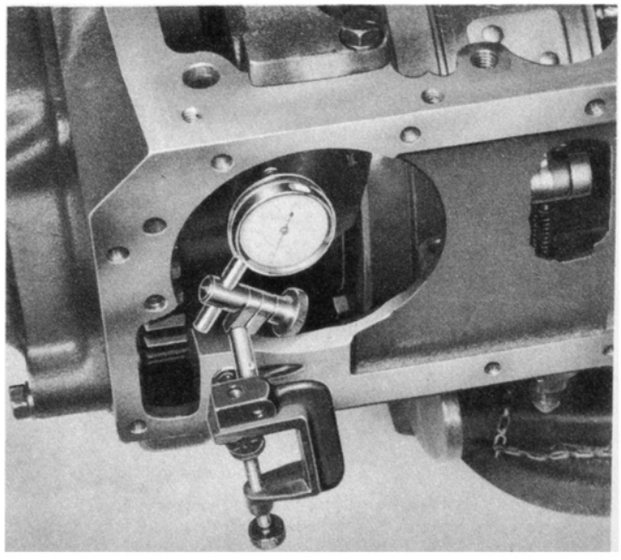


FIGURE 90—*Checking Drive Flange Runout.*

governor drive flange, gear set, or complete rear oil pump assembly.

If runout of governor drive flange is less than .002", rotate governor body 180° from original position and recheck governor again. If governor runout still exceeds .005", replace governor.

Disassembly

Remove two screws holding governor bushing retainer to governor body (Fig. 91).

Remove governor bushing and G-2 valve from governor body and remove G-2 valve from governor bushing (Fig. 92).

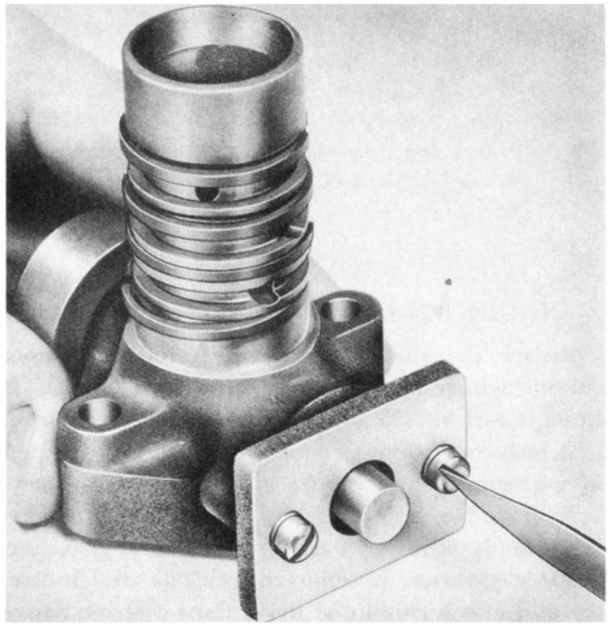


FIGURE 91—*Remove Governor Bushing Retainer.*

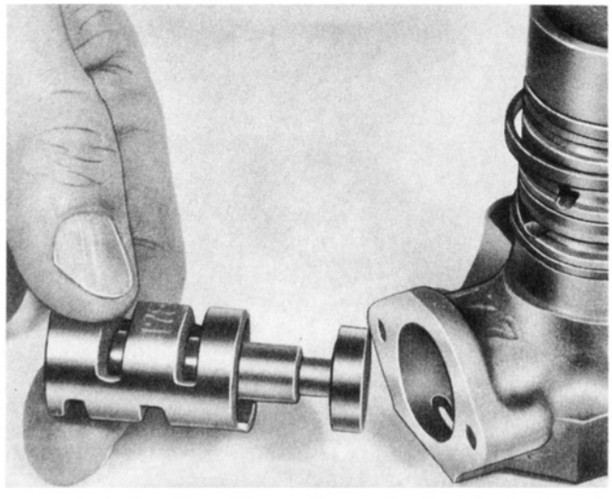


FIGURE 92—*Remove Governor G-2 Valve and Bushing.*

NOTE: *If the G-2 valve cannot be freed up without disassembly, a new governor assembly should be installed.*

Remove the four governor oil seal rings from governor body (Fig. 93).

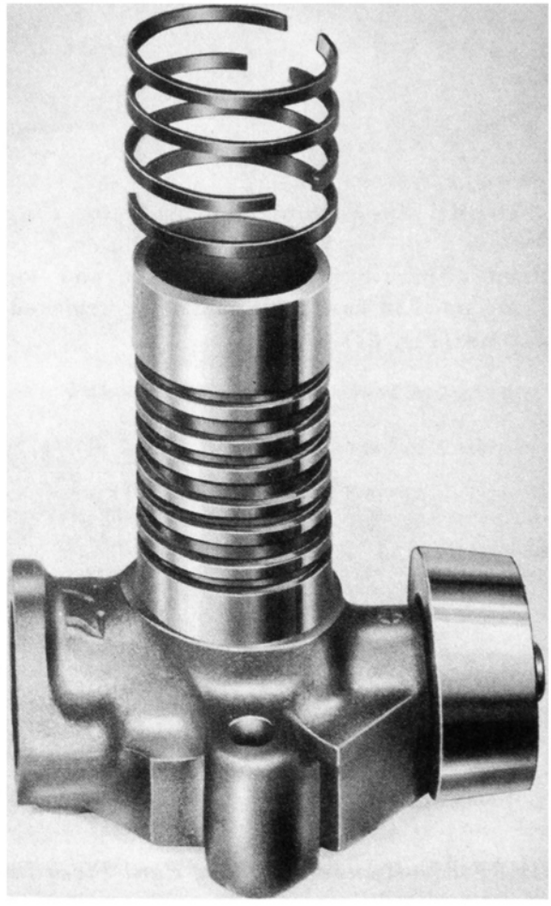


FIGURE 93—*Remove Oil Seal Rings From Governor Body.*

Inspection

Inspect governor ring lands and rings for freedom in grooves. If lands are damaged or worn thin, replace the complete governor assembly.

Check governor valves for freedom in their respective bores.

The valves or bores must not be nicked or scored. Check governor body for sand holes or blocked passages.

Assembly

Install G-2 valve in governor bushing and install bushing into governor body. Index tongue on bushing with recess in casting bore.

Install governor bushing retainer plate with two attaching screws and lock washers. After installation, shake governor body to be sure valves are free.

Install oil rings on governor body and assemble governor assembly to drive flange.

REAR OIL PUMP

To remove the rear oil pump with the governor installed, position the governor so that the large round governor weight is toward the front of the transmission. Remove the two bolts holding governor and rear oil pump to the transmission case.

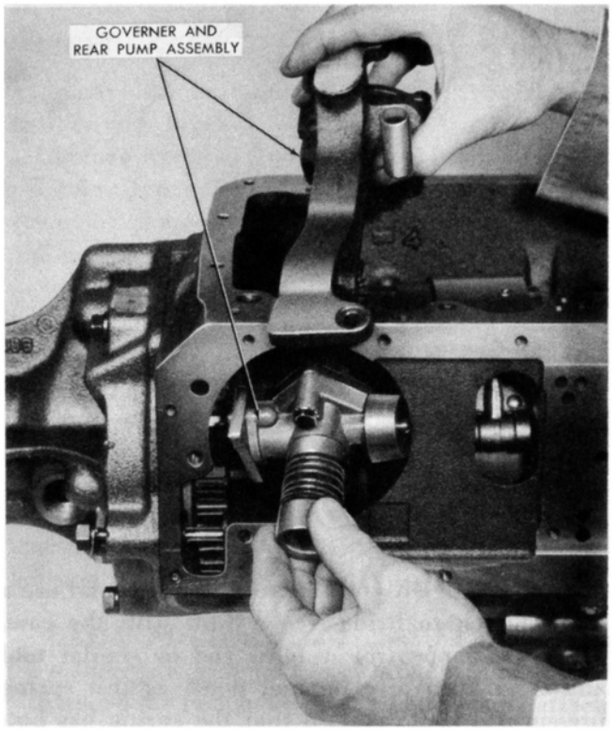


FIGURE 94—*Removing Rear Oil Pump Assembly.*

Remove assembly by moving toward the rear to release the rear oil pump delivery pipe and lift out of case.

Remove four bolts holding rear pump lever to pump body and remove cover. Remove internal tooth oil pump gear.

Check oil pump gears for pitted or scored surfaces. If they are, the complete rear oil pump assembly has to be replaced.

PRESSURE REGULATOR VALVE

Disassembly

Disconnect T.V. rod from throttle lever and disconnect shift control rod at transmission shift lever.

Loosen pressure regulator valve plug in transmission case.

CAUTION: *Pressure regulator valve assembly is under spring pressure.*

After loosening, hold pressure against regulator plug while unscrewing by hand. Remove plug, spring, and valve (Fig. 95).

Inspection

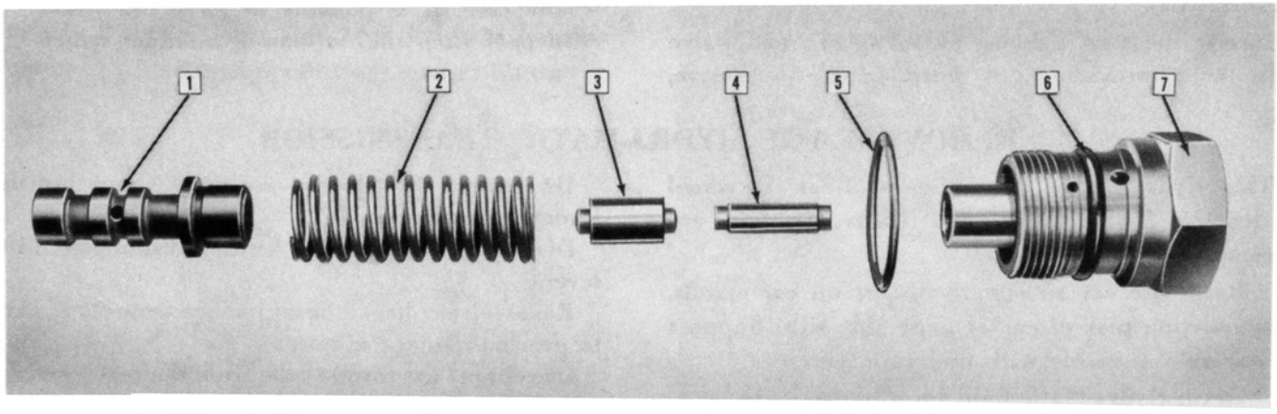
Inspect reverse booster plug and T.V. plug for nicks, scores, and free movement in regulator plug.

Inspect pressure regulator valve for nicks or scores and free movement in pump body. Check drilled passages in valve to see that they are not obstructed.

Check pressure regulator spring for distortion or collapsed coils. The free length of the spring should be approximately $2\frac{11}{64}$".

Inspect drilled passages in pressure regulator plug and remove any foreign matter.

Inspect neoprene seal and gasket on pressure regulator plug. The neoprene seal should be replaced if there is the slightest doubt regrading its condition.



1. Pressure Regulator Valve
2. Pressure Regulator Spring
3. Reverse Booster Plug
4. T.V. Pressure Plug
5. Pressure Regulator Plug Gasket
6. Pressure Regulator Plug Seal
7. Pressure Regulator Plug

FIGURE 95—*Pressure Regulator Assembly.*

Assembly

Install new plug gasket and neoprene seal.

CAUTION: *BE SURE TO INSTALL THE PLUG GASKET ON THE PRESSURE REGULATOR PLUG WITH THE SEAM SIDE TOWARD THE THREADED END.*

Install the pressure regulator valve and spring in the case, indexing the valve with the bore in the front oil pump.

Install the T.V. pressure plug and reverse booster plug in the pressure plug. Use petrolatum to maintain parts in position and install in case. Torque to 40 foot pounds.

Fold floor mat back and remove floor hole cover. Remove pipe plug (located between band adjusting screws) and install gauge J-2540 and test oil pressure.

To test oil pressure, start engine and operate until temperature reaches 140° to 160°F. Set hand brake. Block wheels for safety and set selector lever in D range. Main line pressure should read 45 to 72 pounds.

Place selector lever in neutral, turn off engine, and remove gauge. Install pipe plug securely and replace front hole cover and floor mat.

LINE EXHAUST VALVE

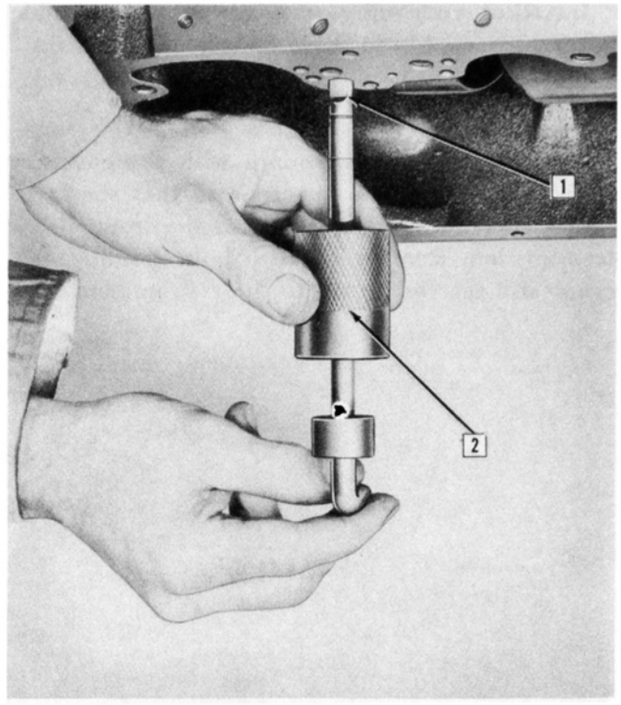
The line exhaust valve sleeve can be removed only after the front servo and oil pan is removed. Remove the sleeve from the case with tool J-5177. The valve and spring will then fall out (Fig. 96).

Inspection

Inspect the line exhaust valve for nicks or score marks. The valve should be free in the case. Inspect the sleeve for damage and check the spring for collapsed coils or distortion.

Assembly

Install the line exhaust valve spring and valve in the transmission case bore. Install the sleeve, tapping it in gently with a soft hammer, and use a blunt punch to bring sleeve flush with the case. Then use a piece of welding rod or similar tool and work the valve up and down against spring pressure to make certain that the spring has bottomed in the bore.



1. Sleeve
2. Sleeve Removing Tool J-5177

FIGURE 96—*Removing Line Exhaust Valve Sleeve.*

CAUTION: *The relieved side of the sleeve should be toward the front servo to provide clearance for the front servo to case attaching bolt. The sleeve should bottom in the bore with the edge of the sleeve flush with the case. It is possible to force the sleeve deeper than the bottoming shoulder which would impair the valve operation.*

REMOVING THE HYDRA-MATIC TRANSMISSION

The Hydra-Matic Transmission, Rear Flywheel Housing, Torus Cover, and Torus Members are removed as an assembly.

Raise the car sufficiently to set on car stands, supporting rear of car at body side sills. Support rear axle assembly with hydraulic jack.

Drain Hydra-Matic fluid from transmission.

Disconnect hand brake cable at the bell crank and brake cable housing at the bell crank bracket.

Disconnect speedometer cable and housing at transmission adapter.

Disconnect throttle rod assembly from throttle lever at transmission.

Disconnect control rod from transmission shift lever.

Remove rear brake hose bracket from floor pan to prevent damage to hose.

Disconnect the torque tube from the rear bearing retainer and separate by sliding the universal joint to the rear, off the splines of the output shaft.

Support the rear end of the engine to remove weight from the rear engine support cross member (Fig. 97).

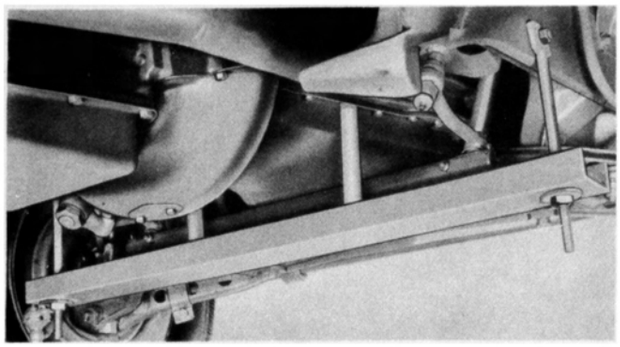


FIGURE 97—*Rear Engine Support Fixture.*

Remove the rear engine support cross member, cushion and bracket assembly.

Remove flywheel housing lower cover.

Drain Hydra-Matic Fluid from torus cover by removing the pipe plug using a six point socket.

Remove throttle control lever from transmission to prevent bending it while removing and replacing transmission.

Remove the 30 torus cover to flywheel attaching bolts and lock washers.

Lower engine SLIGHTLY to remove flywheel housing attaching bolts.

Place hydraulic jack with tool J-2808 under transmission, handle to the rear of car, and lift transmission slightly to take strain off rear flywheel housing bolts.

CAUTION: *Tool J-2808 must be fastened securely to jack pad to prevent slipping.*

Remove the rear housing to front housing attaching bolts, nuts, and lock washers.

NOTE: *The lower studs on each side of rear housing also hold the rear engine supports to housing.*

Remove the upper rear stud on each side of housing and enter two 9/16" USS bolts, approximately 2 inches long, into rear flywheel housing (one on each side) just above dowel pins. Thread bolts into housing to remove rear housing dowel pins from front flywheel housing. After dowel pins are free of front housing, remove the two bolts (Fig. 98).

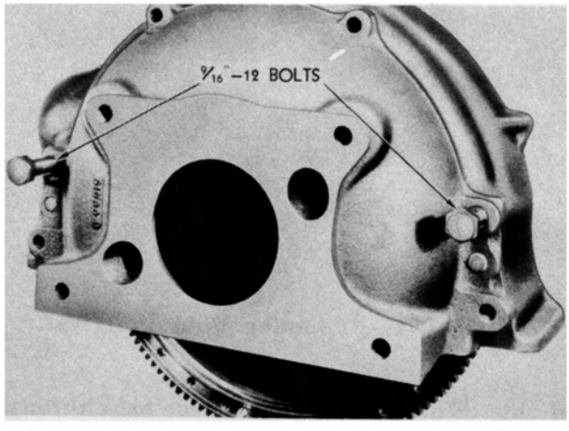


FIGURE 98—*Removing Dowel Pins from Housing.*

Remove transmission assembly by moving the transmission to the rear of the car and lower assembly after main shaft has been withdrawn from the crankshaft pilot bushing.

NOTE: *To prevent end of mainshaft striking the flywheel to crankshaft bolts when lowering the transmission, turn flywheel so end of mainshaft will pass between two bolts.*

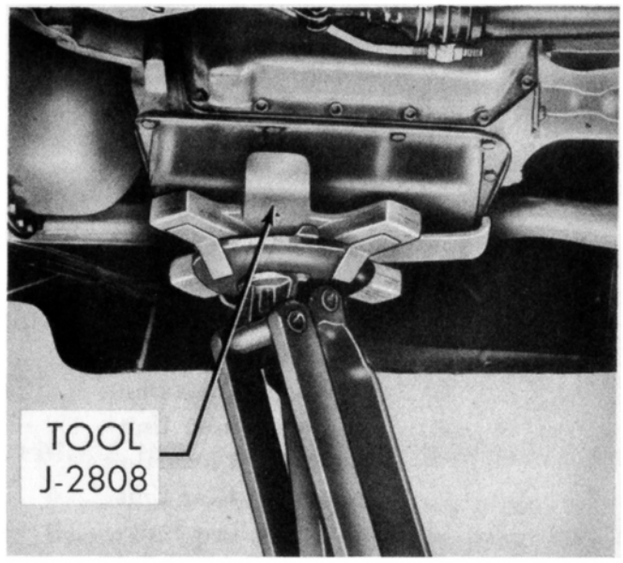


FIGURE 99—*Removing Transmission with Tool J-2808.*

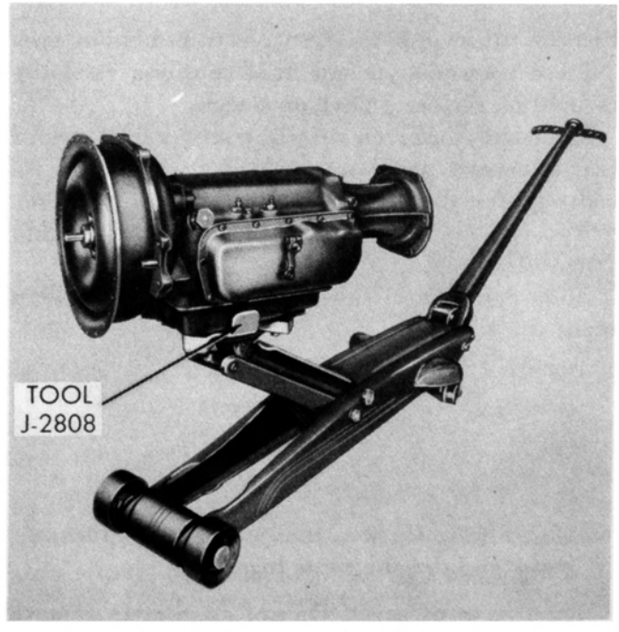


FIGURE 100—*Transmission Removed with Tool J-2808.*

TRANSMISSION DISASSEMBLY, INSPECTION AND ASSEMBLY OF UNITS

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TRANSMISSION DISASSEMBLY

Remove oil level indicator from transmission case.

Place transmission and fluid coupling assembly in holding fixture J-2541 on bench.

Move shift lever on side of transmission toward rear to reverse position.

Straighten the main shaft nut lock washer.

Remove main shaft nut, using $1\frac{7}{16}$" socket (Fig. 101).

Slide driven torus off front end of transmission main shaft.

NOTE: *If torus sticks, tap end of main shaft with rawhide or similar hammer.*

Remove driving torus snap ring (Fig. 102).

Remove driving torus assembly (Fig. 103).

CAUTION: *Do not attempt to remove torus cover and driving torus together.*

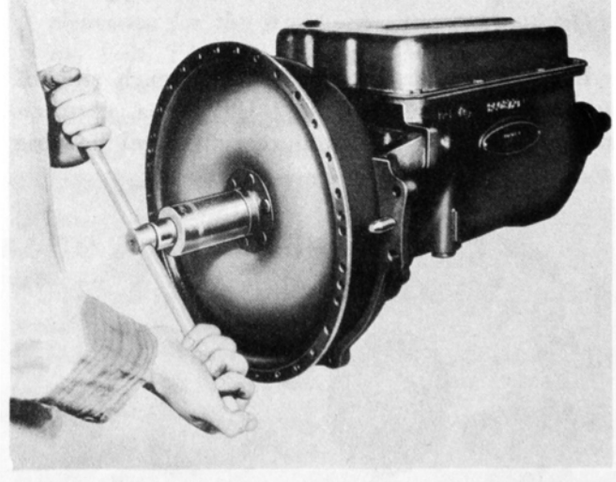


FIGURE 101—*Removing Main Shaft Nut.*

Remove torus cover. Do not attempt to remove torus cover by pulling and pushing on cover in a rough manner as this may result in a broken oil seal ring. Work hub of torus cover back through oil seals gently, and then pull torus cover forward with a quick jerk.

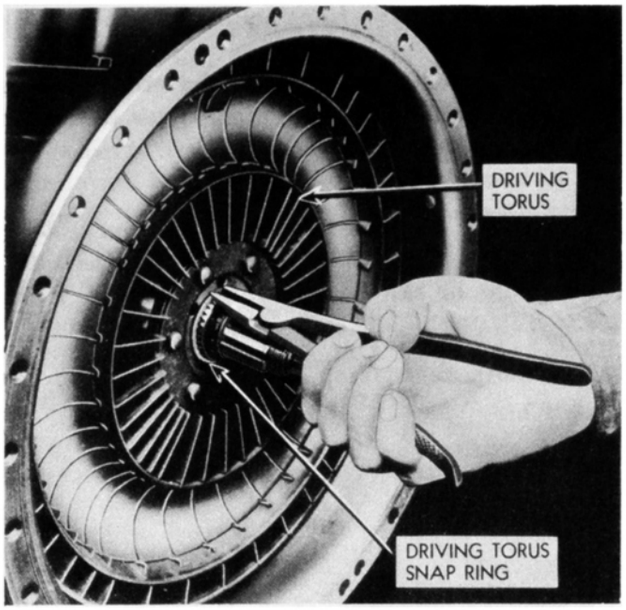


FIGURE 102—*Removing Driving Torus Snap Ring.*

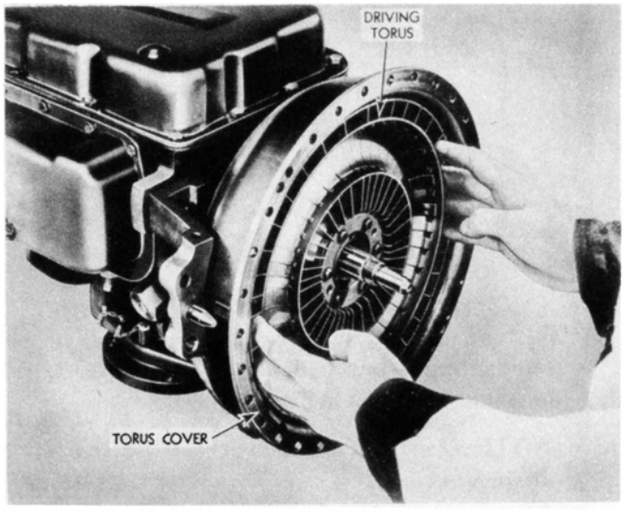


FIGURE 103—*Removing Driving Torus.*

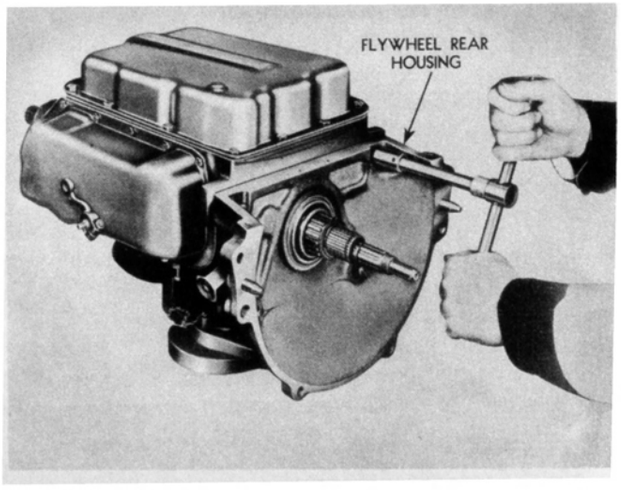


FIGURE 104—*Removing Flywheel Rear Housing.*

Remove bolts and lock washers holding flywheel rear housing to front of transmission case; remove flywheel rear housing (Fig. 104).

Move shift lever on side of transmission to "L" position.

Loosen clamp bolt holding shift lever to shaft at side of transmission and remove lever.

Remove main shaft snap ring with snap ring pliers KMO-630 (Fig. 105).

Remove oil pan bolts and lock washers; remove oil pan gasket.

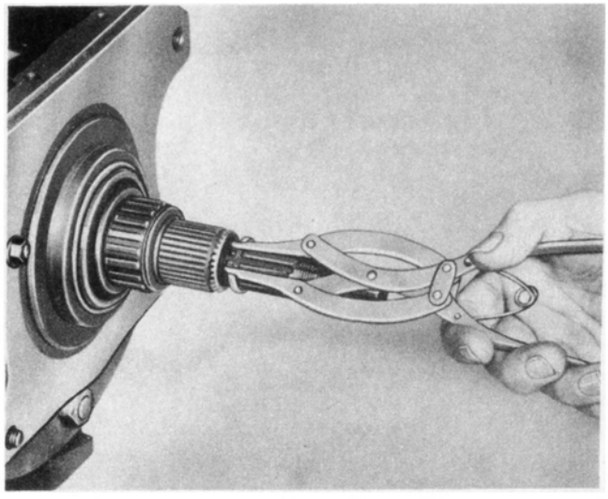
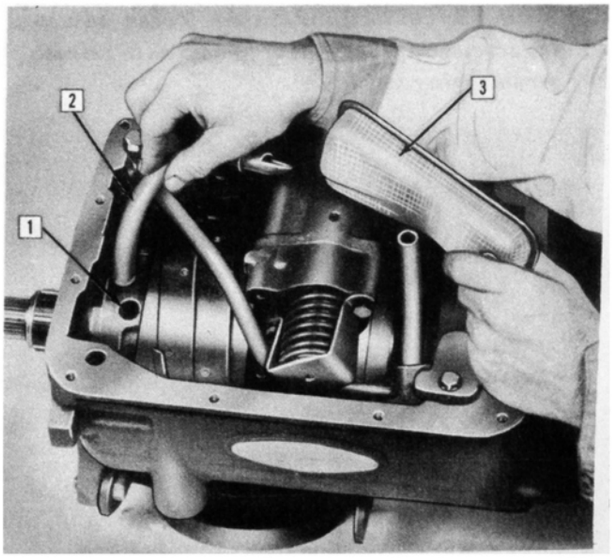


FIGURE 105—*Removing Main Shaft Snap Ring.*

Remove side cover bolts and cover gasket.

Remove oil pan screen by lifting from rear oil pump intake pipe and sliding screen toward rear



1. Oil Seal Ring in Front Pump Housing
2. Front Pump Intake Pipe
3. Oil Screen

FIGURE 106—*Remove Oil Pan Screen and Front Pump Intake Pipe.*

from the front pump intake pipe. Use care not to damage screen.

Remove front oil pump intake pipe by lifting out of front pump (Fig. 106).

Remove the governor oil delivery pipe by prying it up evenly on both ends (Fig. 107).

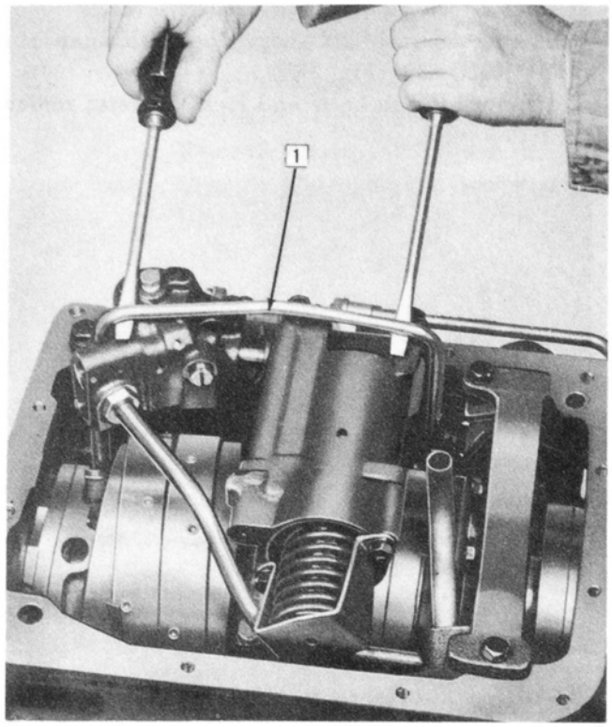


FIGURE 107—*Remove Governor Oil Delivery Pipe.*

Rear Servos and Oil Pipes

NOTE: *Loosen the front and rear band adjusting screw lock nuts; then loosen adjusting screws approximately five turns to release servo spring tension.*

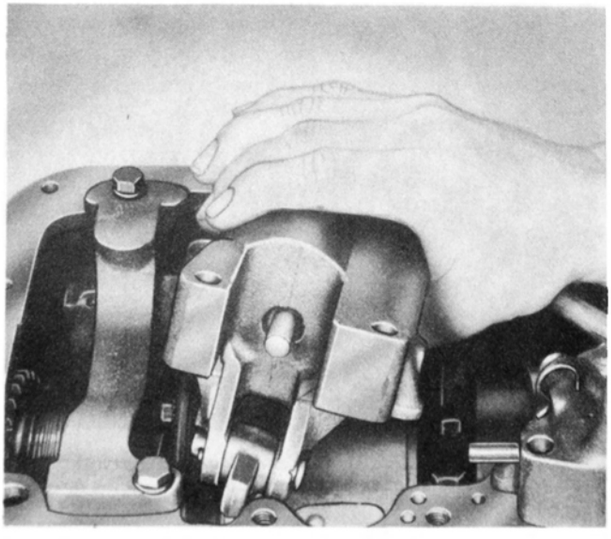


FIGURE 108—*Remove Rear Servo.*

Then remove the front and rear servo attaching bolts.

Remove rear servo unit by separating front and rear servos at oil transfer pipe. Leave the pipe in servo in which it remains (Fig. 108).

Remove front servo unit.

NOTE: *As front servo is lifted from transmission, the rear pump discharge pipe will rotate in the front fitting and slide free (Fig. 109).*

Remove rear pump discharge pipe from rear pump.

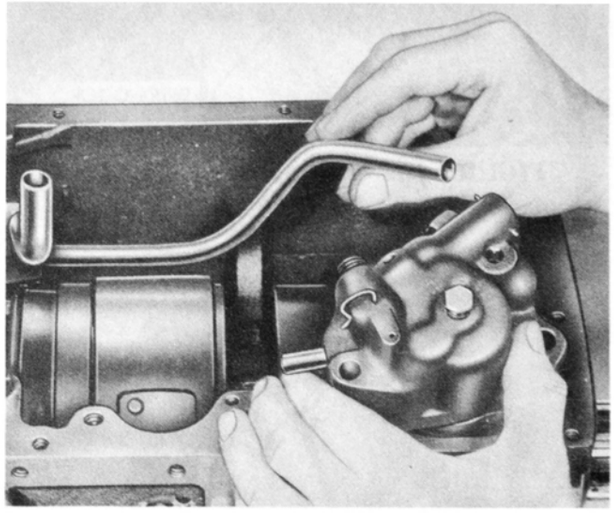


FIGURE 109—*Remove Front Servo Unit.*

Remove front pump delivery pipe (Fig. 110) if it does not come out with servo.

NOTE: *For front and rear servo Disassembly, Inspection and Assembly, refer to Minor Services and Repairs.*

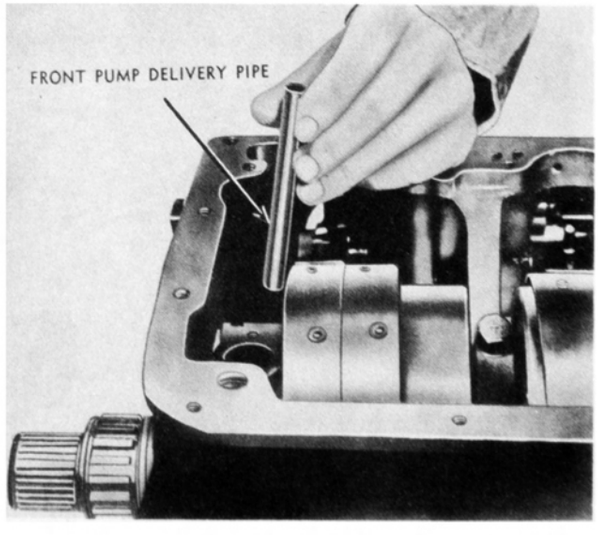


FIGURE 110—*Removing Front Pump Oil Delivery Pipe.*

Remove Control Valve Assembly

Position inner detent control lever in "L" range and remove the pressure regulator reverse oil pipe from control valve and case. (Use very light pressure to avoid bending pipe.)

Remove the four mounting bolts and move control valve assembly toward the rear to release assembly from oil delivery pipes (Fig. 112).

NOTE: *Oil delivery pipes may come off with control valve assembly, if so, remove them from control valve to prevent damage to pipes.*

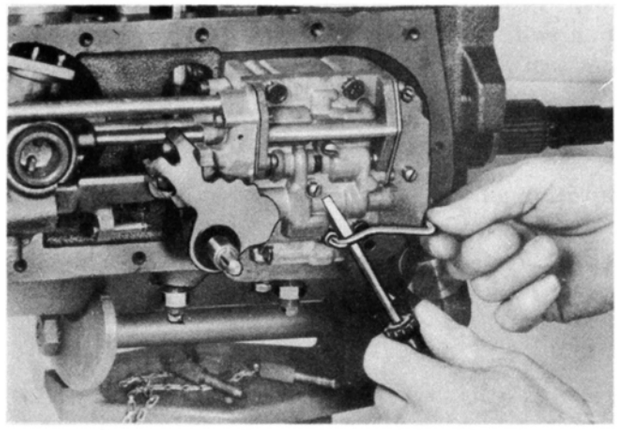


FIGURE 111—*Remove Pressure Regulator Reverse Oil Pipe.*

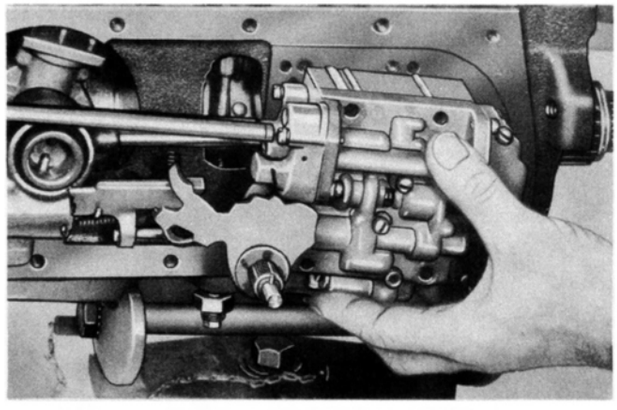


FIGURE 112—*Remove Control Valve Assembly.*

Wrap control valve assembly in clean rag and set aside to prevent damage.

NOTE: *Refer to Minor Services and Repairs for disassembly, inspection and assembly of the Control Valve Assembly.*

Remove Parking Brake Assembly

Remove reverse cone clutch oil delivery pipe (Fig. 113).

Remove parking brake pawl pivot bolt at rear of transmission and lower parking pawl in case (Fig. 114).

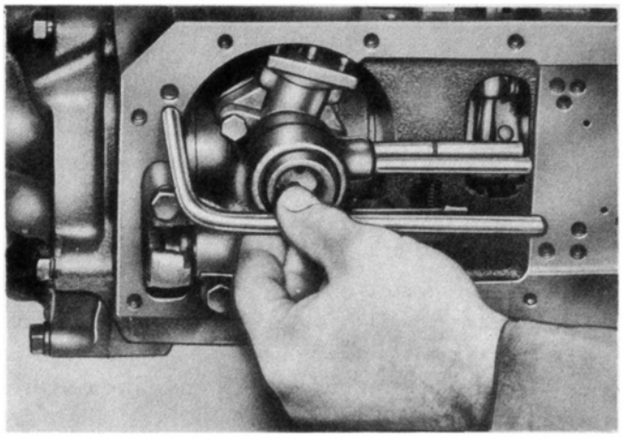


FIGURE 113—*Remove Reverse Cone Clutch Oil Delivery Pipe.*

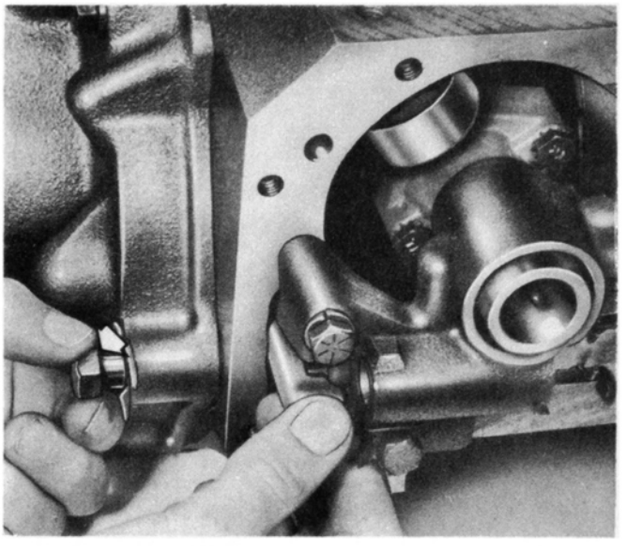


FIGURE 114—*Remove Parking Brake Pawl Pivot Bolt.*

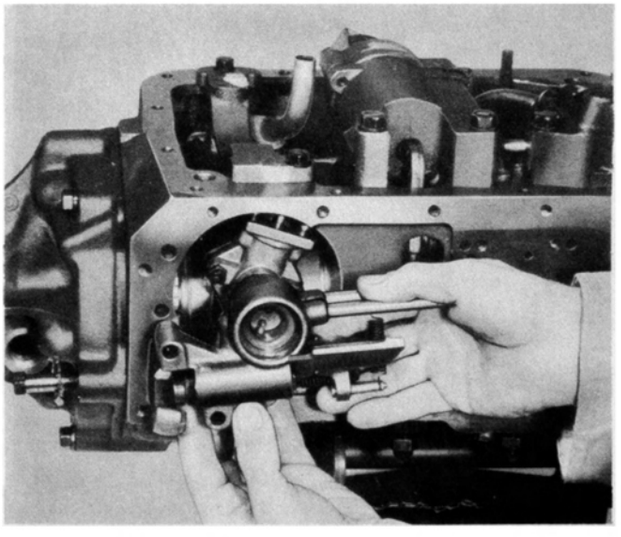


FIGURE 115—*Remove Parking Brake Bracket Assembly.*

Remove two parking brake bracket to case bolts and remove parking brake bracket assembly by pulling off governor (Fig. 115).

NOTE: *Refer to Minor Services and Repairs for disassembly, inspection and assembly of the parking brake assembly.*

Checking Governor Runout

Mount dial indicator on side of transmission and check governor runout at tower about ¼" from the end of the governor. (Fig. 116).

Rotate shaft several revolutions and note runout which should not exceed .005" limit. If limit is within .005" no further check is required.

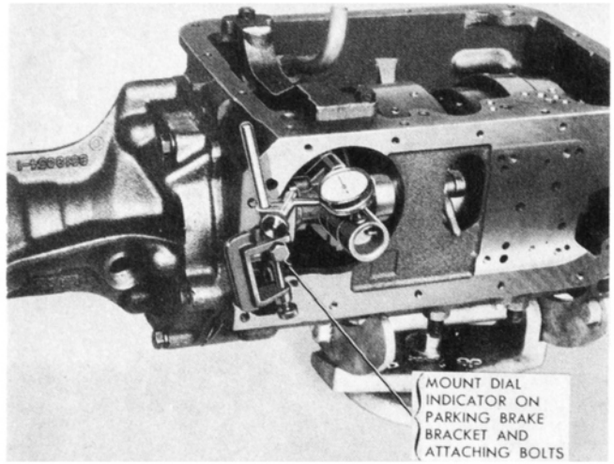


FIGURE 116—*Checking Governor Runout.*

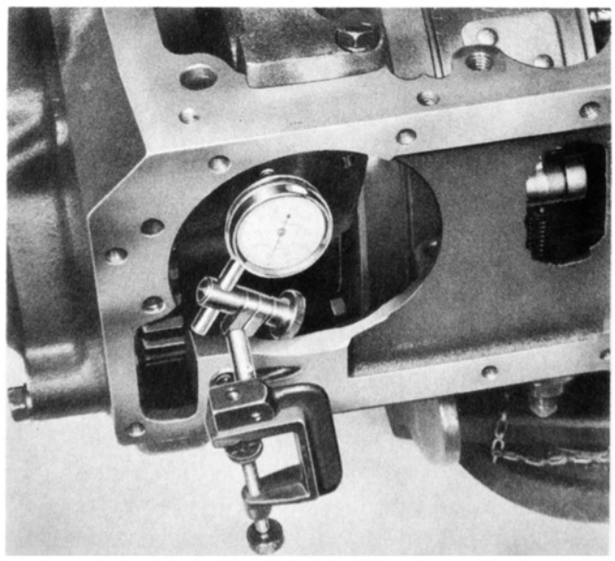


FIGURE 117—*Checking Drive Flange Runout.*

If governor runout exceeds .005" mark position of governor body on rear oil pump drive flange, and remove governor. After governor is removed, relocate dial indicator and check runout of drive flange. Drive flange runout should not exceed .002" (Fig. 117).

If runout of drive flange exceeds .002", correct condition by replacing one or all of the following parts—governor drive flange, gear set or complete rear oil pump assembly.

If runout of governor drive flange is less than .002" rotate governor body 180° from original position and recheck governor again. If governor runout still exceeds .005" replace governor.

Remove Governor and Rear Pump Assembly

Position governor so that the large round governor weight is toward the front of the transmission (Fig. 118).

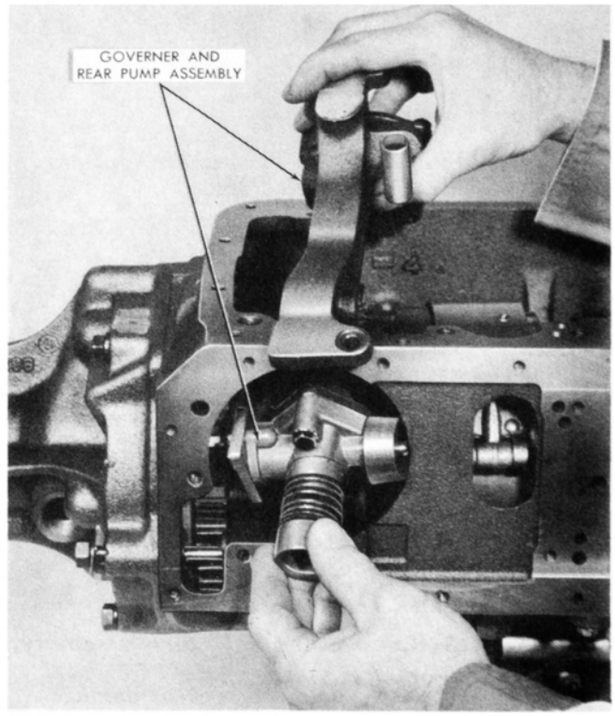


FIGURE 118—*Remove Governor and Rear Pump Assembly.*

To remove governor and rear pump assembly from transmission; position one reverse drive flange attaching bolt up.

Remove two bolts and lock washers holding governor and rear pump to transmission case.

Remove assembly by moving toward control valve assembly side of transmission case and raise rear of pump to clear case.

Remove Pressure Regulator Assembly

Loosen pressure regulator valve plug in transmission case using a 1¼" socket wrench.

CAUTION: *Pressure regulator valve assembly is under spring pressure. Hold pressure against regulator plug while unscrewing by hand.*

Remove plug, spring, and valve as an assembly; the reverse booster plug and T.V. plug are located in the pressure plug (Fig. 119).

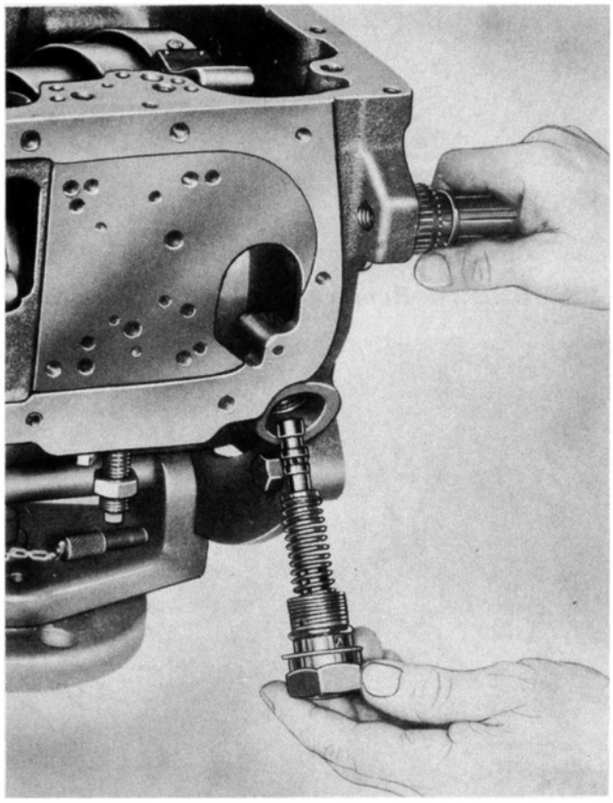


FIGURE 119—*Removing Pressure Regulator Plug Assembly.*

NOTE: *Refer to Minor Services and Repairs for disassembly, inspection, and assembly.*

Check End Clearance of Main Shaft

Install Main Shaft End Play Guide J-2587 over main shaft and front planet carrier.

Set up dial indicator on transmission case using tool J-1465 (Fig. 120).

Insert screw driver between the front clutch drum unit and center bearing cap holding front planet unit forward. The screw driver should be placed at an angle to prevent damage to the oil delivery sleeve.

Move main shaft back and forth (Fig. 120). End clearance should be .004" to .015" and be sure to get just float. Pulling too hard will compress clutch release springs.

Remove screw driver from between front clutch drum and center bearing cap. If the dial indicator reading is less than .004" or more than .015", correct by replacing with a new selective thrust

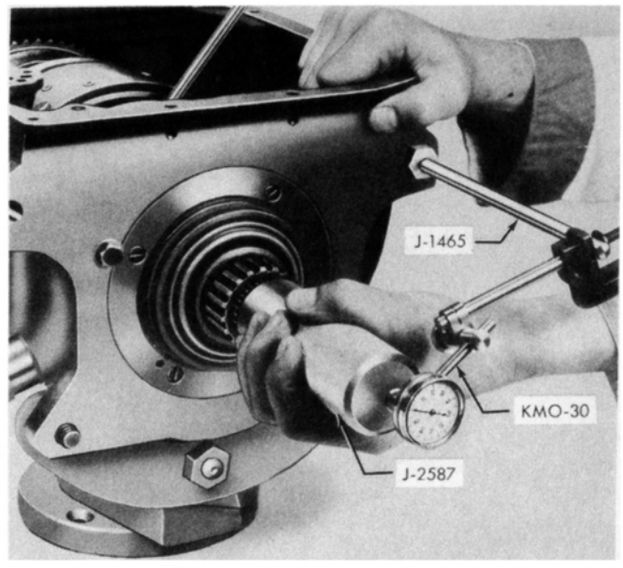


FIGURE 120—*Checking Main Shaft End Play.*

washer; these are supplied in various thickness. Remove the dial indicator.

FRONT OIL PUMP

Disassembly

Remove main shaft snap ring with snap ring pliers and remove the steel and bronze thrust washers from the planet carrier shaft.

Remove the two front pump attaching bolts and locating washer. Then remove the front pump and front drive gear together from the transmission (Fig. 121). Remove bronze thrust washer from front end of planet carrier.

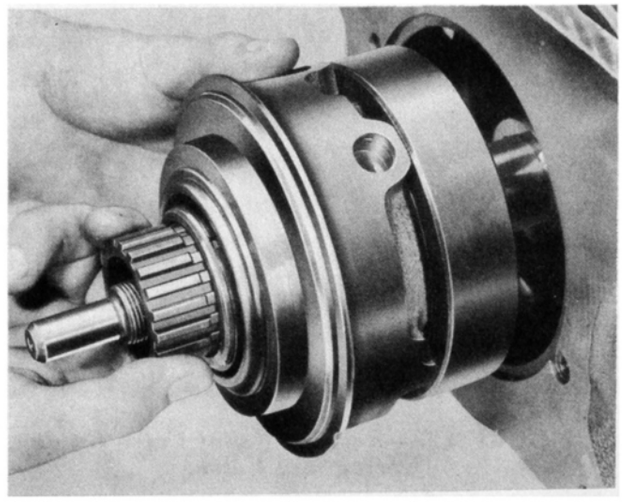


FIGURE 121—*Remove Front Pump and Front Drive Gear.*

Remove front drive gear. Remove four oil pump cover to body attaching screws and washers. Use J-2184-A pump holder and socket set (Fig. 122).

Lift pump body from the cover.

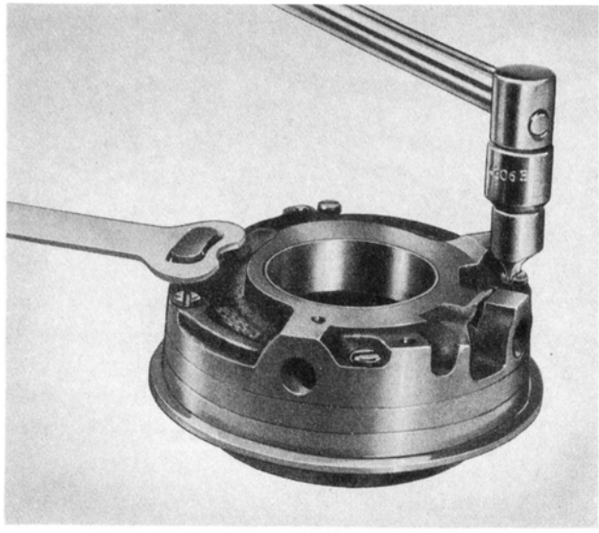


FIGURE 122—*Remove Four Pump Cover to Body Attaching Screws.*

NOTE: *Never lift the cover from the body. This could permit the internal parts to fall from the assembly.*

Remove relief valve guide from the oil pump body by pressing on the guide with a blunt screwdriver and slipping the pin from the body. Hold the guide with finger pressure to prevent it from popping out too fast. Remove guide, spring and valve. The valve can be removed with snap ring pliers (Fig. 123).

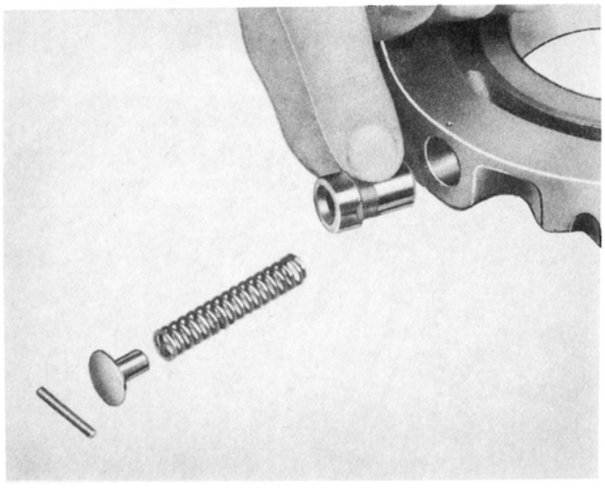


FIGURE 123—*Remove Relief Valve Guide Spring and Valve.*

Remove front pump intake seal from front pump body intake port and discard.

Mark face of rotor with pencil or prussian blue so that it will be returned to its original position.

Remove guide rings, rotor and seven vanes (Fig. 125).

Remove slide and priming spring (Fig. 126).

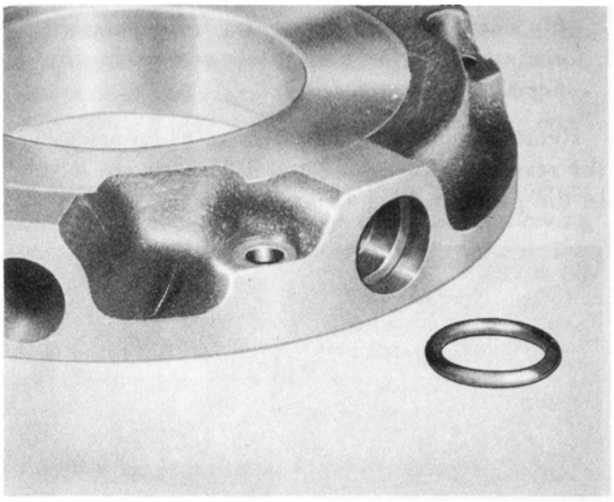


FIGURE 124—*Remove Front Intake Pipe Seal.*

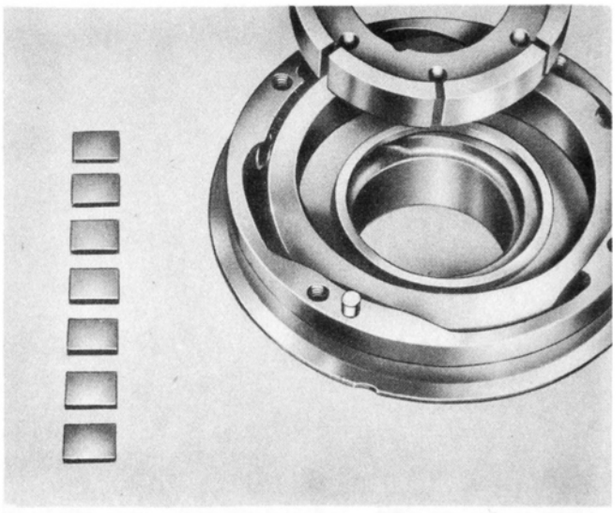


FIGURE 125—*Remove Guide Rings, Rotor and Seven Vanes.*

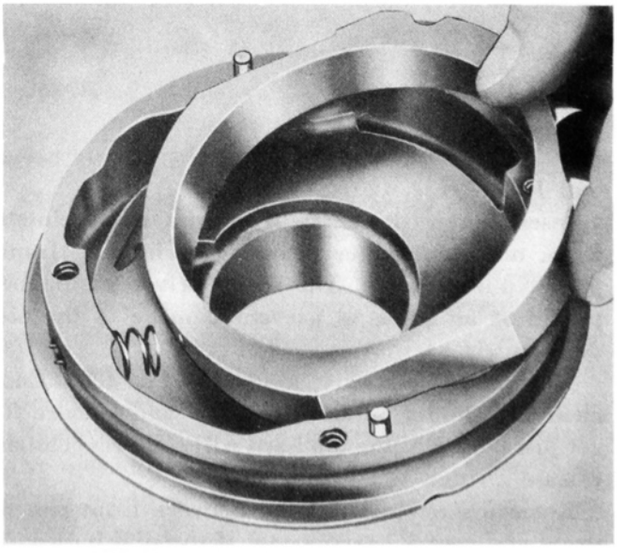


FIGURE 126—*Remove Slide and Priming Spring.*

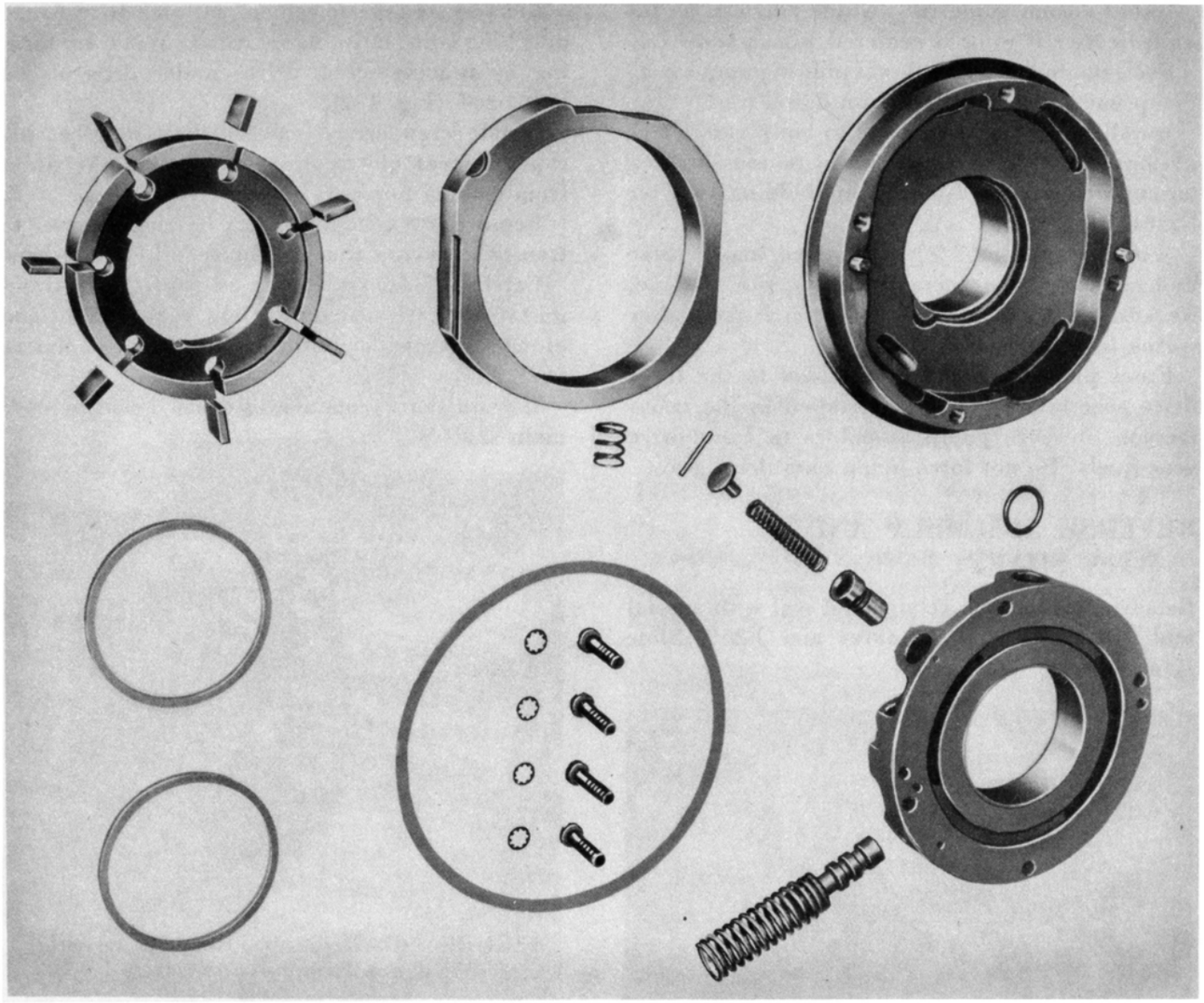


FIGURE 127—*Disassembled View of Front Pump.*

Inspection of Front Oil Pump

The entire unit should be inspected for dirt, or scoring (Fig. 127).

Check slide to be sure the two (2) bleed holes are open and free of dirt. A piece of tag wire should be pushed through the holes to insure that they are open.

Check vanes to see that they are not scored or burred.

Be sure slide is free in pump cover. It should not bind under any circumstances.

Check freeness of pressure regulator valve in pump body bore.

Check freeness of vanes in rotor slots.

Check to be sure oil seal ring is free and not broken.

Check pump bushing for scores or flaking. However, slight wear is permissible.

Check woodruff key slot in rotor for burrs or wear.

Inspect all passages for obstruction.

Check freedom of relief valve in pump body bore.

Assembly of Front Oil Pump

Install relief valve, spring, spring guide and retaining pin in pump body. Use a blunt screwdriver to compress the guide and spring while installing retainer pin.

Install priming spring and slide in pump cover.

CAUTION: *Be sure spring is located properly by moving slide against it until slide bottoms against lower stop in cover.*

Install one guide ring and rotor. Be sure marked face of rotor is up.

Install seven (7) vanes in rotor slots. Be sure vanes fit between guide ring and slide.

NOTE: *Check edges of vanes for wear pattern. One edge will be polished for its full length, this edge should face the slide.*

Install second guide ring. Guide ring can be installed easier if rotor is centered within slide.

Place pump body over dowel pins in pump cover. Pump body should fit freely on dowel pins.

Install four (4) pump cover to body screws and washers and tighten to 12-15 foot pounds using a torque wrench and front pump holding tool set J-2184-A.

With pump completely assembled, move rotor by hand to be sure rotor, vanes and slide are free. Be sure priming spring will return slide after spring is compressed.

Front pump should be assembled to the front drive gear before they are installed in the transmission. Be sure pump assembles to front drive gear freely. Do not force pump onto drive gear.

REVERSE ASSEMBLY AND MAIN SHAFT

Remove rear bearing retainer oil seal with special tool J-4380 Oil Seal Remover and J-2619 Slide Hammer (Fig. 128).

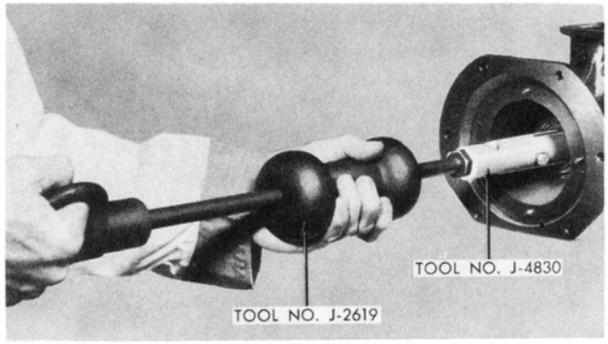


FIGURE 128—*Removing Rear Bearing Retainer Oil Seal.*

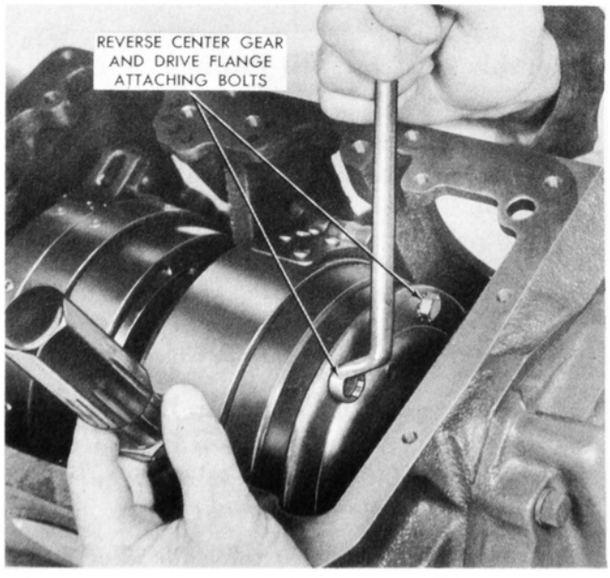


FIGURE 129—*Removing Reverse Center Gear and Drive Flange Attaching Bolts.*

Remove six reverse center gear and drive flange attaching bolts. Drive flange can be held from turning by bracing screw driver under drive flange bolt head (Fig. 129).

Install screw driver between the center bearing cap and rear clutch drum to prevent the drum from moving forward.

Remove five remaining rear bearing retainer to transmission case attaching bolts and lock washers.

Carefully remove reverse assembly from transmission case (if assembly sticks, tap on front end of main shaft with plastic or similar type hammer) (Fig. 130).

If main shaft remained in transmission, remove main shaft.

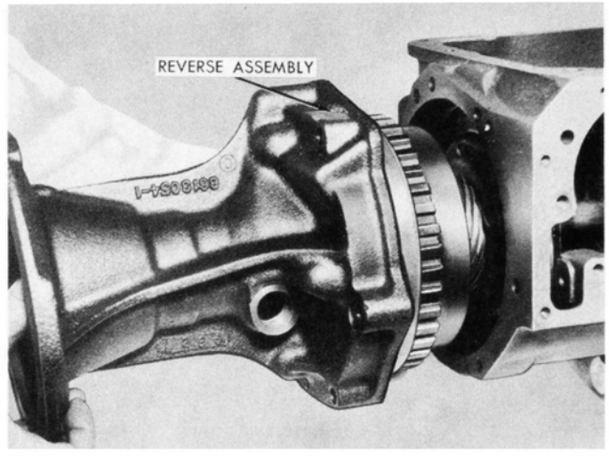


FIGURE 130—*Removing Reverse Assembly from Transmission Case.*

Disassembly of Reverse Assembly

Remove the stationary cone lock key, speedometer driven gear and sleeve assembly from rear bearing retainer, then remove gasket.

Using snap ring pliers, remove snap ring on output shaft inside of rear bearing retainer at ball bearing. This snap ring is smaller than other snap rings used in the transmission.

With bearing retainer laying on its side, remove output shaft from bearing retainer (Fig. 131). (It may be necessary to tap output shaft with a plastic hammer while holding rear bearing retainer to separate units.)

Remove reverse internal gear and stationary cone from rear bearing retainer by compressing stationary cone by hand.

Remove snap ring, locating ball bearing in rear bearing retainer, with a screw driver. (A new snap ring must be used when assembling.)

With special tool J-4670 Clutch Spring Compressor, compress the reverse cone clutch release springs and remove the large snap ring (Fig. 132).

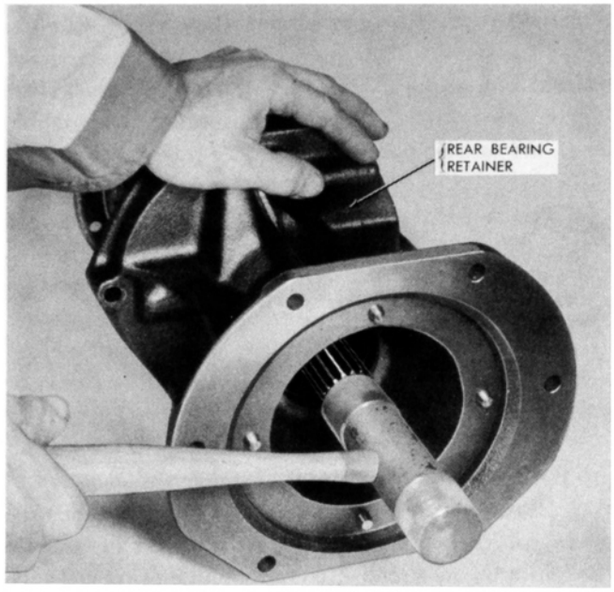


FIGURE 131—*Removing Output Shaft From Rear Bearing Retainer.*

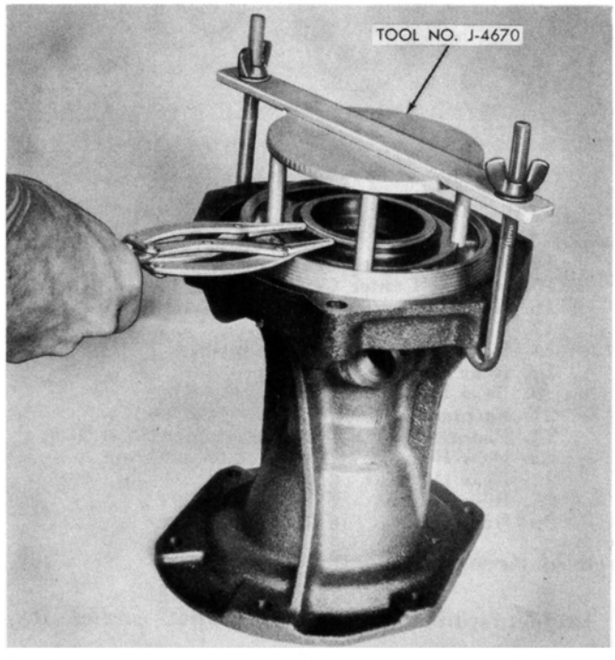


FIGURE 132—*Removing Reverse Cone Clutch Retaining Snap Ring.*

Remove special tool and remove coil spring retainer.

Remove the six coil release springs.

Remove reverse piston by pulling straight out. (Do not try to turn piston since it is located by two dowel pins.)

Remove outer oil seal from reverse piston.

Remove inner oil seal from the rear bearing retainer hub (Fig. 133).

Remove large bronze thrust washer from reverse internal gear.

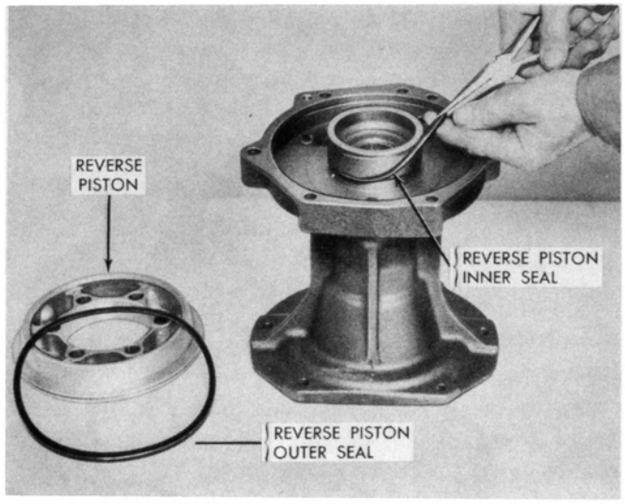


FIGURE 133—*Removing Reverse Piston Inner and Outer Oil Seals.*

Remove reverse stationary cone from reverse internal gear cone by using large snap ring pliers KMO-410 to expand cone (Fig. 134).

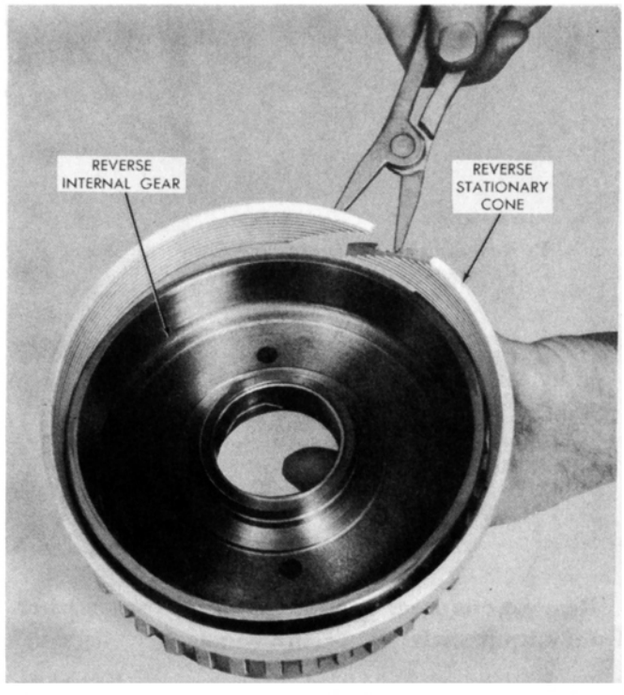


FIGURE 134—*Removing Reverse Stationary Cone.*

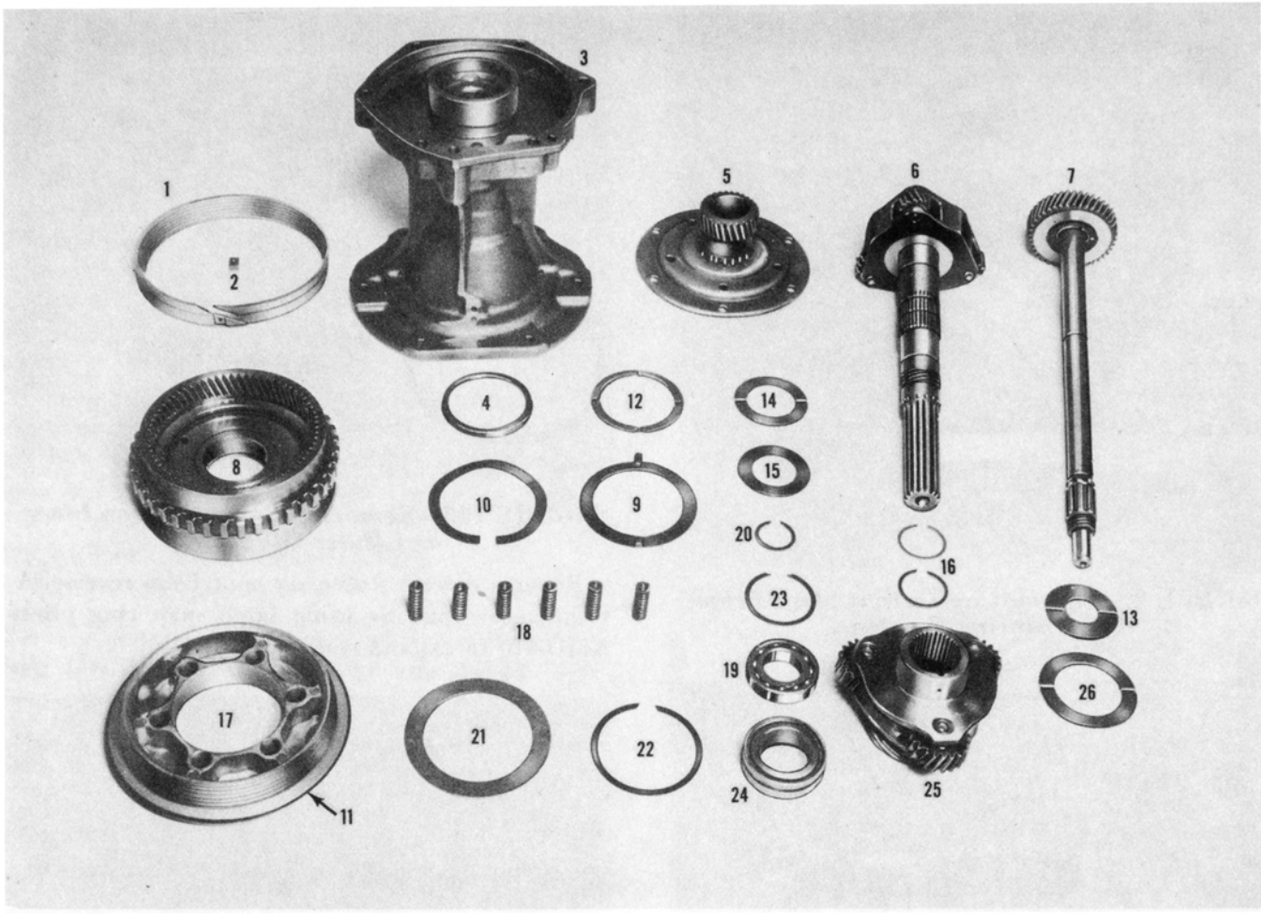
Remove reverse clutch release wave spring and spring retainer from reverse internal gear by lifting straight out.

Remove the snap ring, that holds the reverse planet carrier, from the output shaft with snap ring pliers.

Remove reverse planet carrier from output shaft.

Remove reverse planet carrier locating snap ring from output shaft with snap ring pliers.

Remove reverse sun gear and drive flange assembly from output shaft.



1. Reverse Clutch Stationary Cone
2. Reverse Stationary Cone Key
3. Rear Bearing Retainer
4. Reverse Piston Inner Seal
5. Reverse Drive Flange Assembly
6. Output Shaft Assembly
7. Main Shaft
8. Reverse Internal Gear Assembly
9. Reverse Clutch Release Spring Retainer
10. Reverse Clutch Release Spring
11. Reverse Piston Outer Seal
12. Reverse Internal Gear Thrust Washer
13. Selective Thrust Washer
14. Reverse Center Gear Thrust Washer
15. Reverse Center Gear Backing Thrust Washer
16. Reverse Carrier to Output Shaft Snap Rings
17. Reverse Piston
18. Reverse Piston Release Springs
19. Rear Bearing (Ball Type)
20. Rear Bearing to Shaft Snap Ring
21. Spring Retainer Washer
22. Piston to Rear Bearing Retainer Snap Ring
23. Rear Bearing to Retainer Snap Ring
24. Rear Oil Seal
25. Reverse Planet Carrier Assembly
26. Rear Clutch Hub Thrust Washer

FIGURE 135—*Disassembled View of Reverse Assembly.*

Remove one steel and one bronze thrust washer from output shaft.

Inspection of Reverse Assembly and Main Shaft

Inspect ball bearing by thoroughly cleaning and oiling, then rotate slowly by hand, feeling for roughness. Do not spin bearing with air.

Inspect reverse internal gear for damaged teeth and scored or damaged inside bearing surface.

Inspect reverse internal gear for scored or burned cone surface.

Inspect reverse internal gear parking teeth for damage.

Inspect reverse planet carrier for worn or damaged teeth and worn roller bearings.

Inspect splines of reverse planet carrier for damage.

Inspect bronze oil pump drive gear for damage or excessive wear. See that bronze gear is tight on carrier and that pump drive gear ball is in place.

Inspect gear in reverse center gear and flange assembly for damaged teeth or worn bushing. If gear is damaged, replace entire assembly as center gear is not furnished separately.

Inspect output shaft assembly for scored thrust and bearing surfaces.

Inspect output shaft splines for nicks or burrs.

Inspect output shaft speedometer drive gear surface for wear or damage.

Inspect steel and bronze thrust washers for excessive wear.

Inspect internal gear thrust washer for wear or scoring.

Inspect reverse clutch release spring and retainer for signs of damage or burning.

Inspect reverse clutch stationary cone for burning or excessive wear.

Inspect reverse piston coil release springs for distortion or collapsed coils.

Inspect reverse piston for burning on cone surface.

Inspect reverse piston for scores on piston. Be sure oil seal grooves are thoroughly clean.

Inspect two reverse piston pins for scoring, looseness or distortion.

Inspect inner and outer piston seal operating surfaces for scoring or roughness.

Inspect rear bearing retainer bushing for excessive wear and see that oil holes in retainer are open.

Inspect main shaft for damaged gear teeth, thrust and bearing surfaces.

Clean all parts thoroughly.

Assembly of Reverse Unit

Hold the reverse center gear with drive flange up; install the steel thrust washer, and then the bronze thrust washer in the recess of the drive flange.

Still holding the reverse center gear, insert the output shaft through the drive flange and center gear until carrier bottoms on the two thrust washers (Fig. 136).

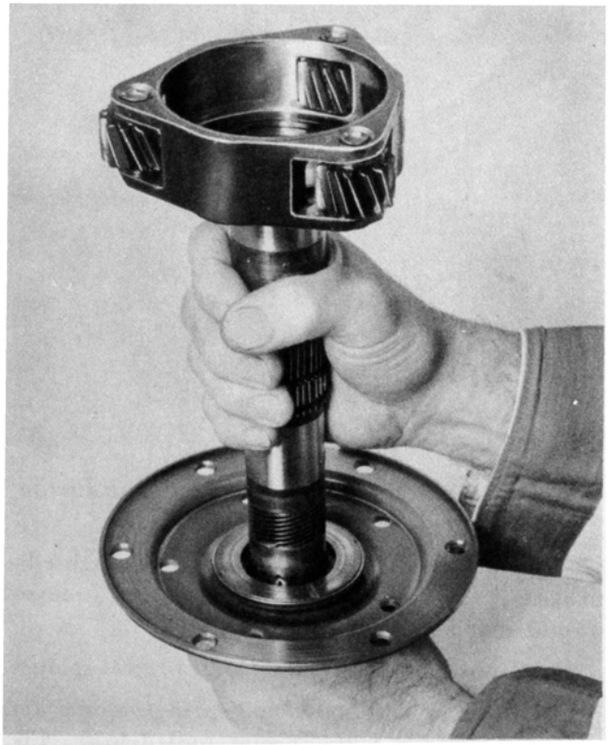


FIGURE 136—*Installing Reverse Center Gear On Output Shaft.*

Holding drive flange and center gear tightly against the carrier to keep thrust washers from moving, set output shaft and carrier on table on the carrier end.

Install reverse planet carrier locating snap ring with snap ring pliers.

NOTE: *Do not pick up this unit until completely assembled to prevent thrust washers from slipping out of place.*

Install reverse planet carrier over output shaft with bronze drive gear down, meshing pinions with the sun gear. (Be certain unit is bottomed against reverse planet carrier locating snap ring).

Using snap ring pliers, install snap ring on output shaft to position reverse planet carrier.

Install reverse clutch release wave spring and spring retainer on internal gear side of reverse internal gear (Fig. 137).

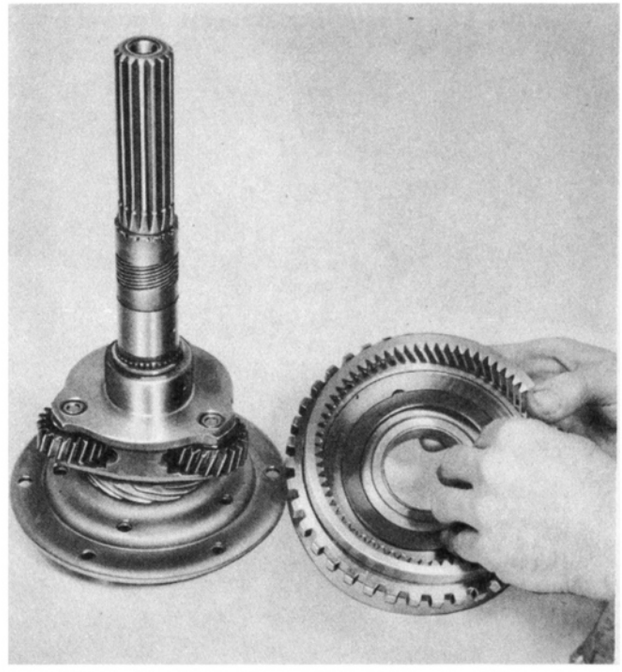


FIGURE 137—*Installing Reverse Clutch Release Spring Retainer.*

Install reverse stationary cone on reverse internal gear cone. (Use snap ring pliers to spread stationary cone for installation) (Fig. 138).

CAUTION: *Do not spread cone more than necessary to make the installation.*

Install reverse cone piston innerseal with lip down (Fig. 139). (Work seal well into groove). Apply light coat of Hydra-Matic fluid over outer surface of inner seal.

Install outer seal on reverse cone piston with seal lip down away from cone and work seal well into groove (Fig. 140). Coat surface of outer seal with Hydra-Matic Fluid.

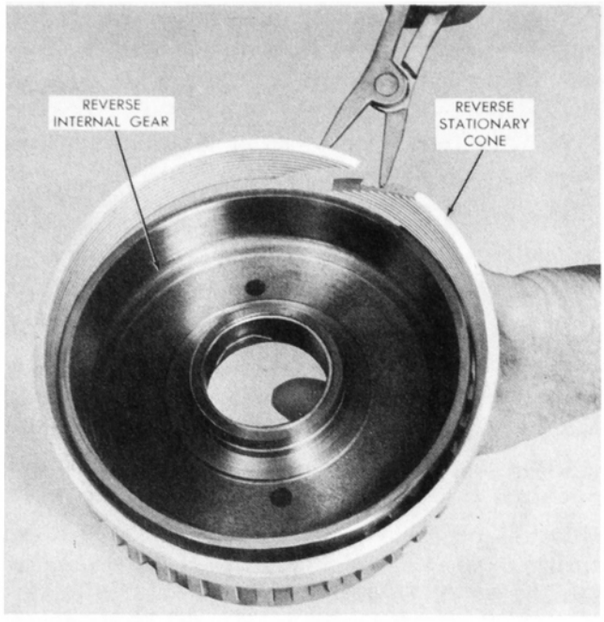


FIGURE 138—*Installing Reverse Stationary Cone.*

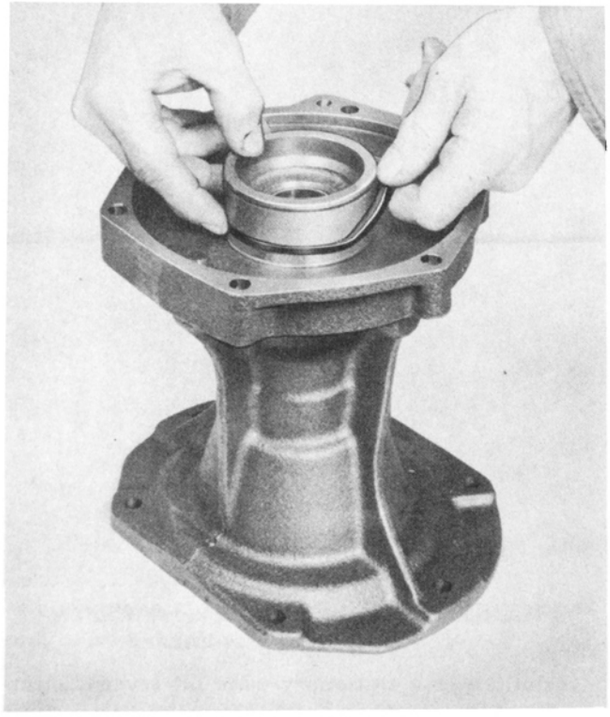


FIGURE 139—*Installing Reverse Cone Piston Inner Seal.*

Install reverse cone piston in rear bearing retainer, so it rests on the dowel pins. Install outer seal compressor tool J-4752 around seal and down into bottom of shallow counterbore of the rear bearing retainer (Fig. 141). Then turn the reverse cone piston until the dowel pins are aligned with holes in piston and carefully push piston into retainer. (Use extreme caution when installing to prevent damage to the seal). To make certain piston is fully seated, lay a straightedge across the face of the piston and measure from straightedge to face of rear bearing retainer. The measurement should read $^{3}/_{8}$" to $^{13}/_{32}$".

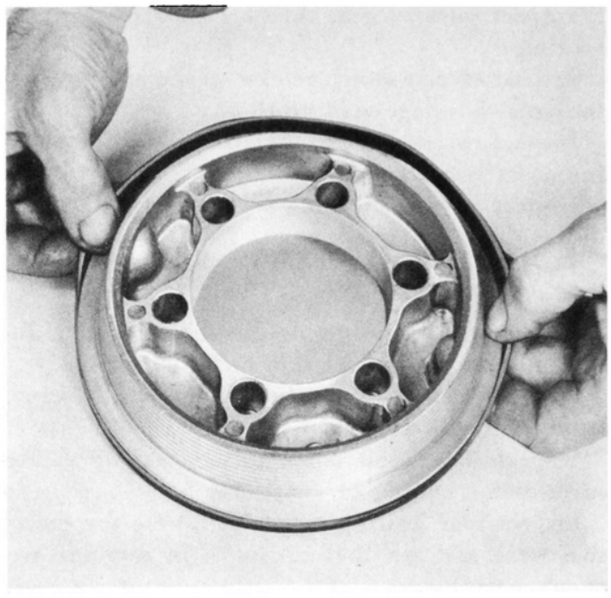


FIGURE 140—*Installing Reverse Cone Piston Outer Seal.*

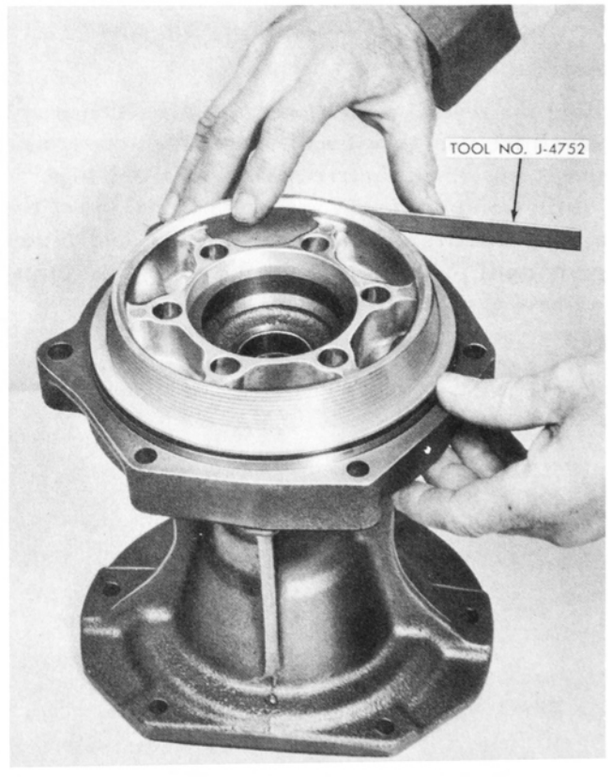


FIGURE 141—*Installing Reverse Cone Piston in Rear Bearing Retainer.*

Install the six reverse clutch release coil springs.

Install the reverse clutch coil spring retainer and compress springs with special tool J-4670 (Fig. 142).

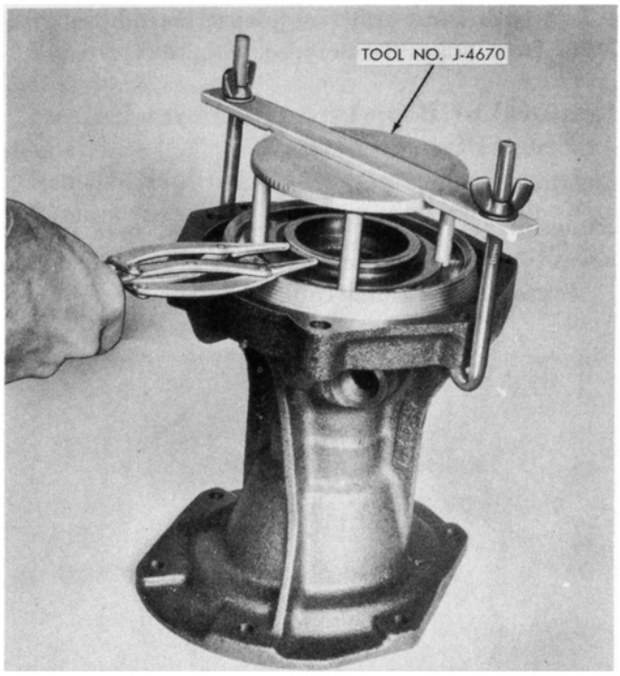


FIGURE 142—*Installing Reverse Clutch Coil Spring Retainer.*

Install large type snap ring, holding retainer in place and remove special tool.

Install ball bearing in rear bearing retainer. (Be sure that the bearing is fully and squarely seated by tapping gently).

Install a new large special type bearing snap ring in the rear bearing retainer.

Install reverse internal gear and stationary cone into rear bearing retainer, compressing stationary cone by hand (Fig. 143). (Position keyway of stationary cone so it will line up with keyway in case when installed.)

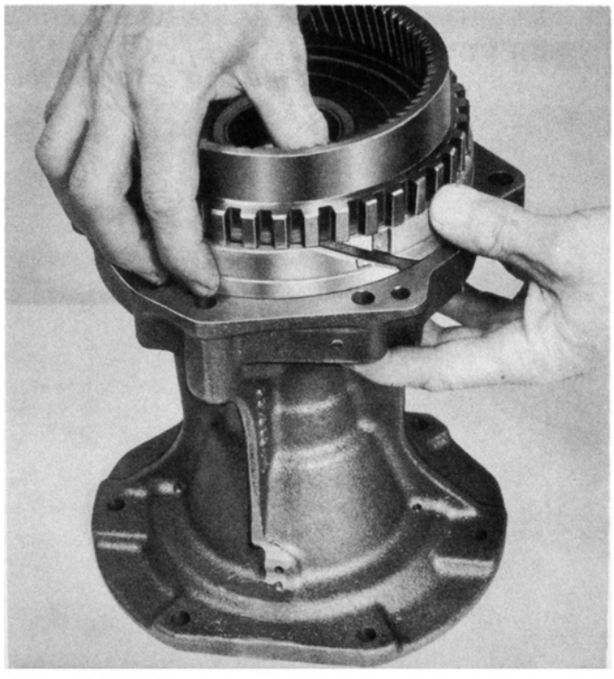


FIGURE 143—*Installing Reverse Internal Gear and Stationary Cone.*

With rear bearing retainer standing on tail end, pick up output shaft assembly and place into rear bearing retainer carefully meshing reverse carrier gears with the internal gear.

NOTE: *Use extreme caution to prevent damage to bushing and ball bearing in rear bearing retainer.*

Install snap ring on output shaft, locking rear bearing retainer to output shaft. This snap ring is smaller than snap rings used elsewhere in the transmission.

Install speedometer gear in rear bearing retainer.

Install rear bearing retainer gasket on rear bearing retainer.

Install stationary cone to case lock key (Fig. 144). Use lubriplate to hold key in place.

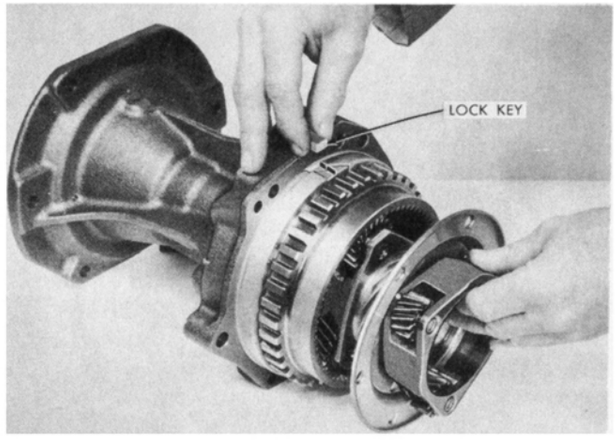


FIGURE 144—*Installing Stationary Cone to Case Lock Key.*

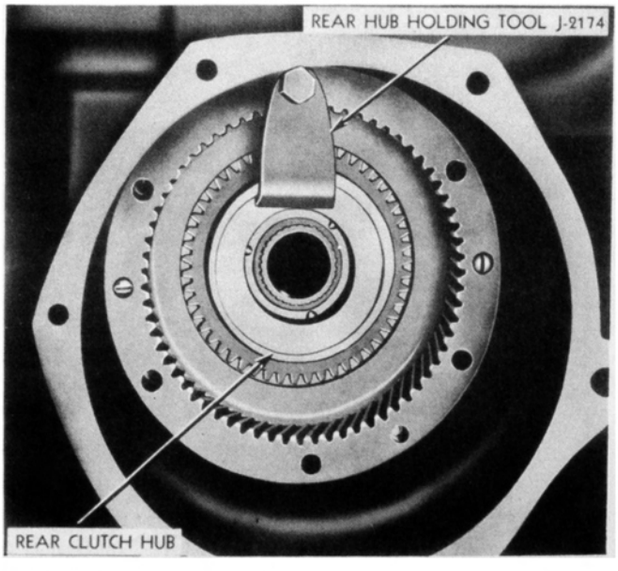


FIGURE 145—*Holding Rear Hub with Tool J-2174.*

FRONT AND REAR DRUM UNITS

Removal

Install rear hub retaining tool J-2174 to rear unit drum using a reverse drive flange attaching bolt (Fig. 145).

Bend back edge of lock plate under two center bearing cap attaching bolts with chisel and light hammer.

Remove two center bearing cap to case bolts and lock plate.

NOTE: *It may be necessary to equalize distance by moving front and rear clutch drums to allow socket wrench to seat on bolt head.*

Lift the rear unit to allow the band to slide clear of drum and remove rear band and strut assembly.

Install spring or wire to hold front band on front unit drum (Fig. 146).

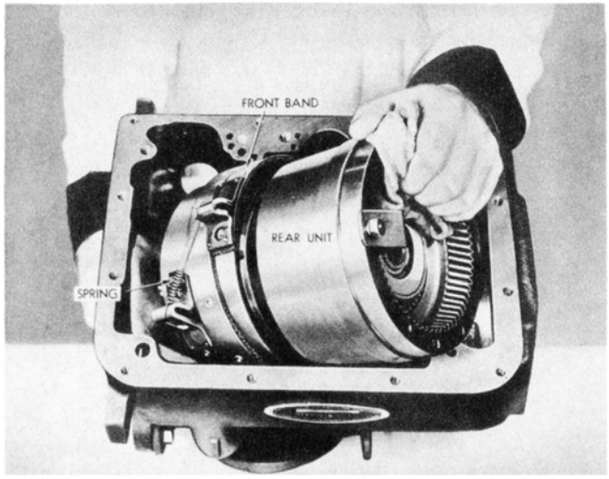


FIGURE 146—*Spring Holding Front Band on Drum.*

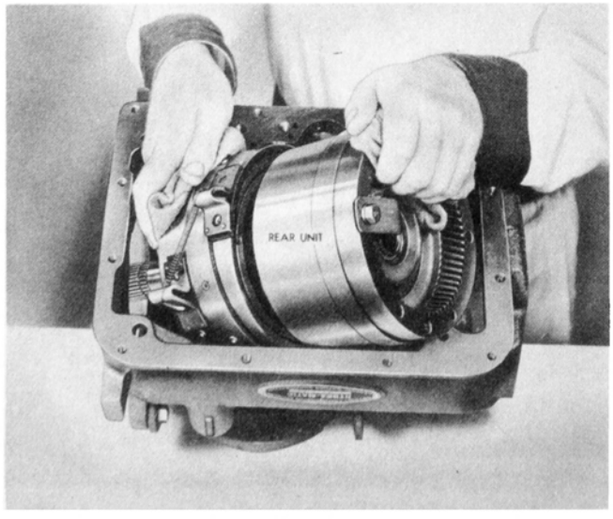


FIGURE 147—*Removing Units from Case.*

Lift both front and rear planet assemblies with band from transmission case. (Fig. 147).

Removal of Rear Unit and Front Unit From Planet Carrier

Remove Front Band

Place planet carrier with front and rear planet assemblies into holding fixture J-2187 (Fig. 148).

Remove rear clutch hub rear snap ring (Fig. 149).

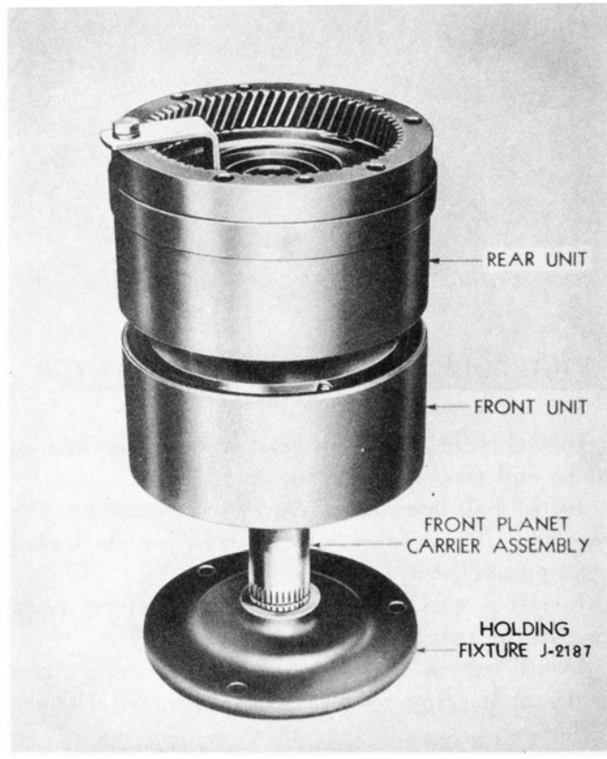


FIGURE 148—*Disassembly of Front and Rear Units.*

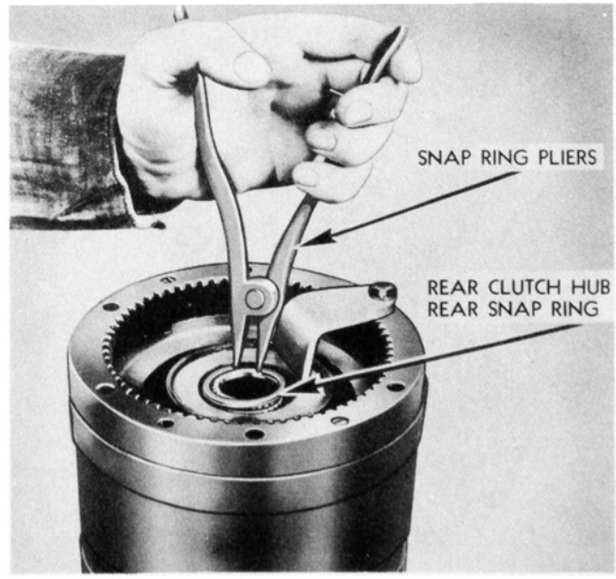


FIGURE 149—*Removing Rear Clutch Hub Rear Snap Ring.*

Lift rear unit from planet carrier.

Remove rear clutch hub front snap ring from planet carrier.

Remove center bearing cap from oil delivery sleeve.

Remove oil delivery sleeve from planet carrier.

Remove snap ring from recess in front unit (Fig. 150).



FIGURE 150—*Removing Snap Ring from Recess in Front Unit.*

CAUTION: *Hold snap ring open while lifting from carrier to avoid damaging bearing surface.*

Lift front unit assembly from planet carrier.

Remove steel and bronze thrust washers from recess of front unit.

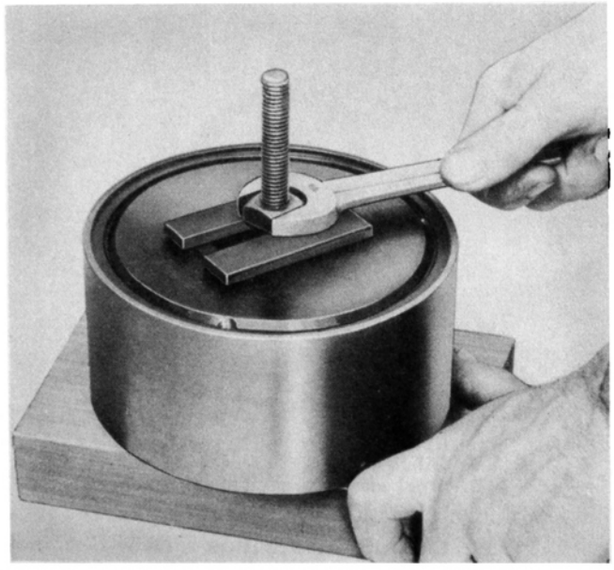


FIGURE 151—*Pressing Clutch Drum.*

Disassembly of Front Unit

Place front unit assembly in press and remove clutch drum snap ring (Fig. 151 and 152). After snap ring is removed release pressure.

Separate drums by tapping front face of center gear on front clutch drum with rawhide or similar hammer (Fig. 153).

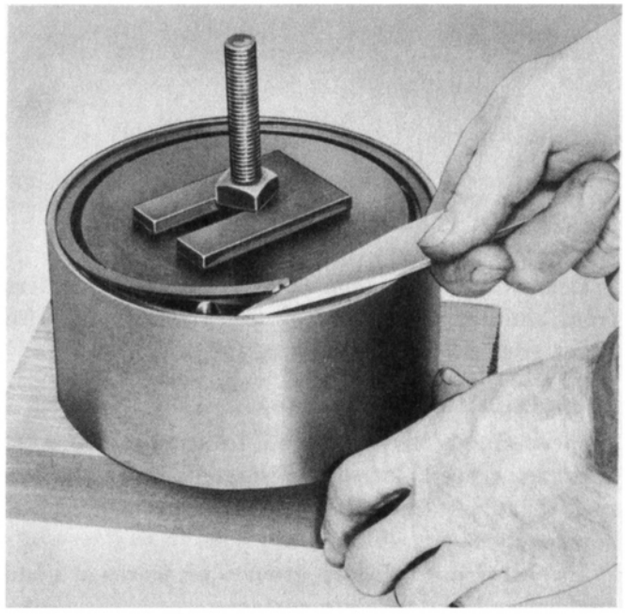


FIGURE 152—*Removing Clutch Drum Snap Ring.*

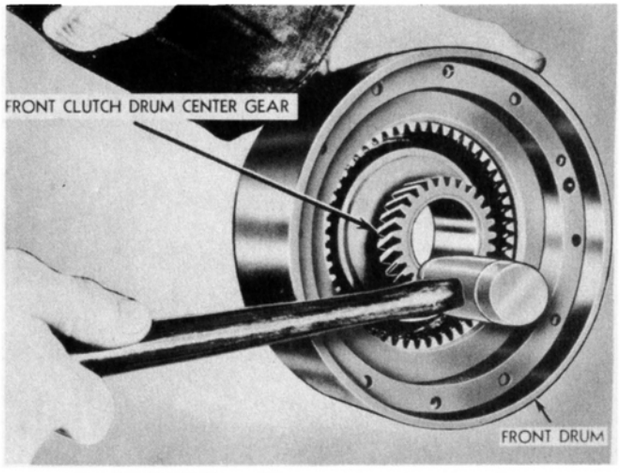


FIGURE 153—*Removing Center Gear and Clutch.*

NOTE: *Use care not to lose clutch release springs.*

Remove six inner and six outer front clutch release springs from front unit drum.

Remove three composition clutch drive and three steel clutch driven plates from drum.

Remove front clutch annular piston from clutch drum by bumping front face of center gear on soft wood block (Fig. 154).

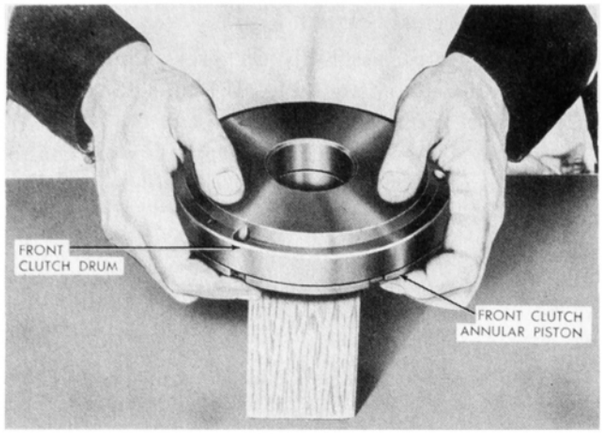


FIGURE 154—*Removing Annular Piston.*

Remove rubber piston seals and brass expanders from annular piston and clutch drum piston. Use blunt edge screw driver (Fig. 155).

Inspection of Front Unit

Inspect clutch drive pins in front unit drum. If they are scored, loose or distorted, replace drum and drive pin assembly. Pins are not furnished separately.

Inspect drum for deep grooves or scores at band surface and clutch plate surface.

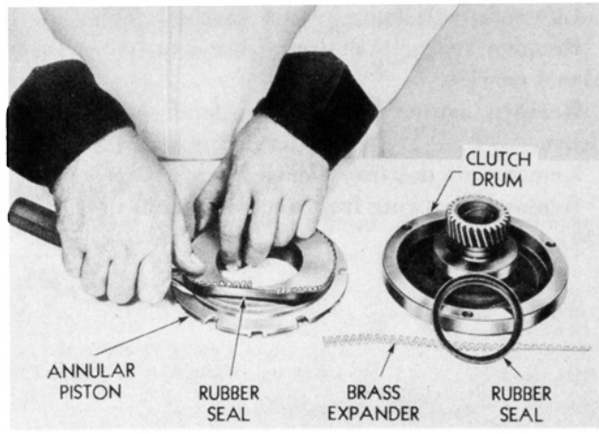


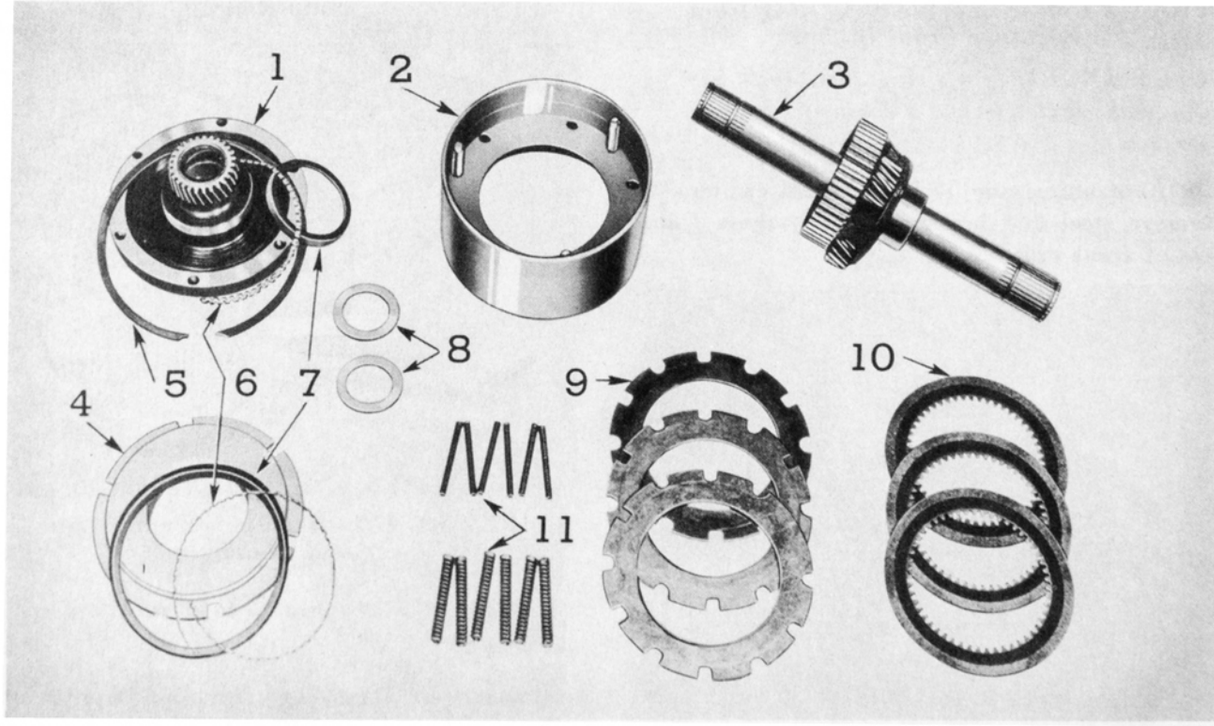
FIGURE 155—*Removing Rubber Seals and Brass Expanders.*

Inspect clutch release springs for distortion or collapsed coils. Free length $2\frac{15}{64}$".

NOTE: *Slight wear, "bright spots," on side of outer release springs indicating slight contact with drum is permissible.*

Inspect clutch drive plates for damaged or loose facings.

NOTE: *If flakes of facing material can be removed by scratching the surface with the*



1. Front Clutch Drum Assembly
2. Front Drum and Pin Assembly
3. Planet Carrier Assembly
4. Clutch Annular Piston
5. Retain Ring
6. Oil Seal Expanders
7. Oil Seals
8. Steel and Bronze Thrust Washers
9. Clutch Driven Plates
10. Clutch Drive Plates
11. Clutch Release Springs

FIGURE 156—*Disassembled View of Front Unit.*

thumbnail, the plate should be replaced. Discoloration of drive plates is not an indication of failure.

Inspect clutch driven plates for scored surfaces. Driven plates must be flat.

Inspect annular clutch piston for scores. Be sure oil seal grooves are thoroughly clean.

Inspect front clutch drum for scores in piston bore, oil delivery sleeve bore and oil seal grooves. Inspect gear teeth and thrust faces for damage.

Inspect front planet carrier gears for damaged teeth and excessive roller bearing wear.

Inspect bearing surfaces of planet carrier shaft.

Inspect steel and bronze thrust washers.

Clean all parts thoroughly. Make a list of those to be replaced.

Installation of Snap Rings

The ends of retaining or snap rings are cut with a double taper to provide a sharp point for tool J-1466A to grip and thereby facilitate disassembly and assembly. Snap rings should always be installed with the points positioned as shown in (Fig. 157).

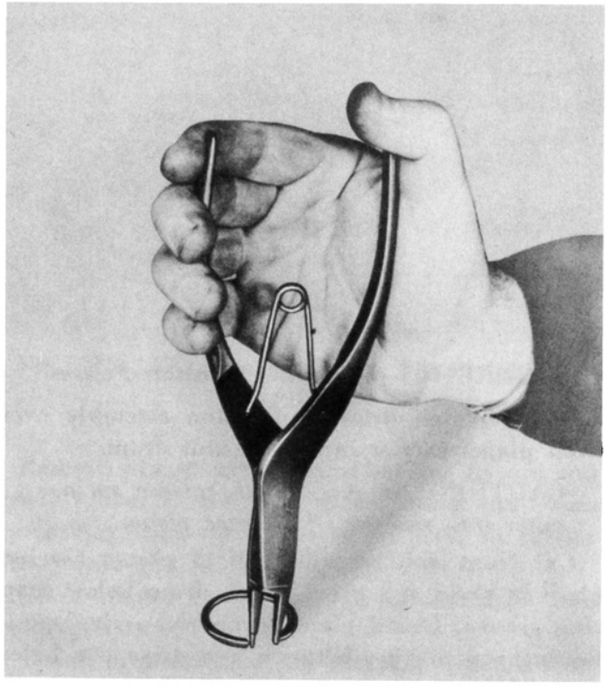


FIGURE 157—*Positioning Snap Ring.*

Assembly of Front Unit

Place front planet carrier assembly in holding fixture J-2187 with clutch hub up.

Place front unit drum over hub to rest on pinion gears with drive pins up (Fig. 158).

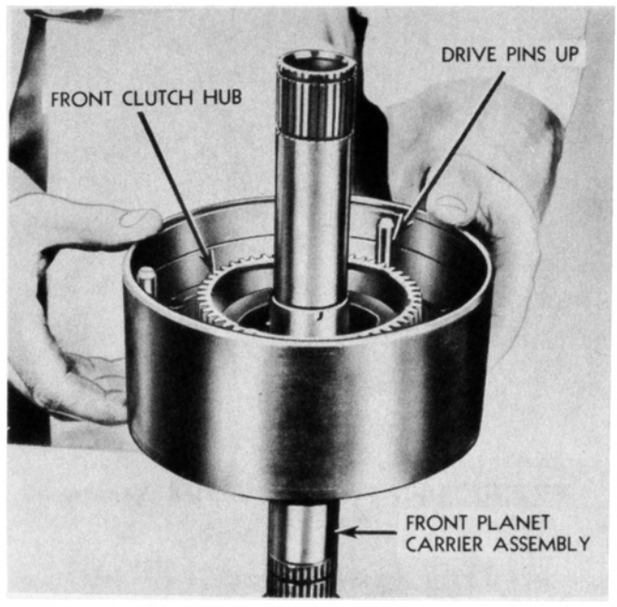


FIGURE 158—*Assembling Front Unit Drum to Planet Carrier.*

Install three drive and three driven plates into front drum, alternating plates. Apply Hydra-Matic fluid to face of each plate surface as assembled.

CAUTION: *Start with a drive (composition) plate and finish with a driven (steel) plate. Assemble the driven plates with square notches over the drive pins (Fig. 159).*

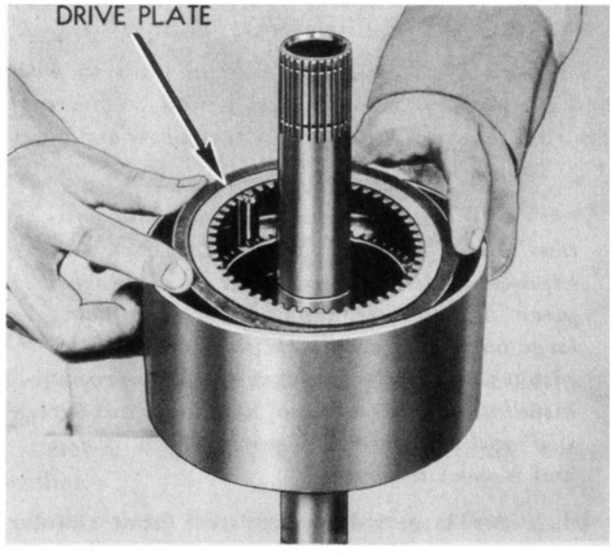


FIGURE 159—*Installing Clutch Plates.*

Install six outer clutch release and then six inner clutch release springs through plates into spring holes of drum (Fig. 160).

Install new inner brass expander into ring groove in clutch drum with expanding lips down (Fig. 161).

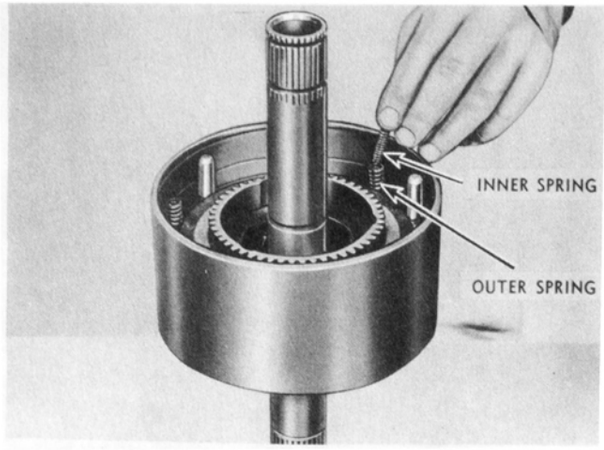


FIGURE 160—*Installing Clutch Release Springs.*

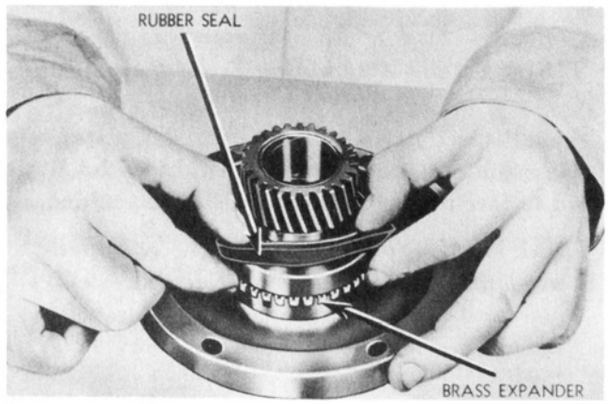


FIGURE 161—*Installing Brass Expander and Rubber Seal.*

While holding brass expander in position with masking tape, work new inner piston rubber seal into ring groove with lip down over brass expander (Fig. 161).

NOTE: *Work expander well back into position under seal so brass edges are not exposed. Hold brass expander in place with piece of masking tape. Before replacing large outer seal on clutch piston, install the piston into the clutch drum to insure proper installation and seating of new inner rubber seal and expander. Remove clutch piston and inspect inner seal.*

Place new large rubber seal over front annular piston beyond seal groove.

Install new large brass expander in piston groove with lips up (Fig. 162).

While holding expander in position, work rubber seal well into groove with lip up.

NOTE: *Work expander well back into position under seal so brass edges are not exposed.*

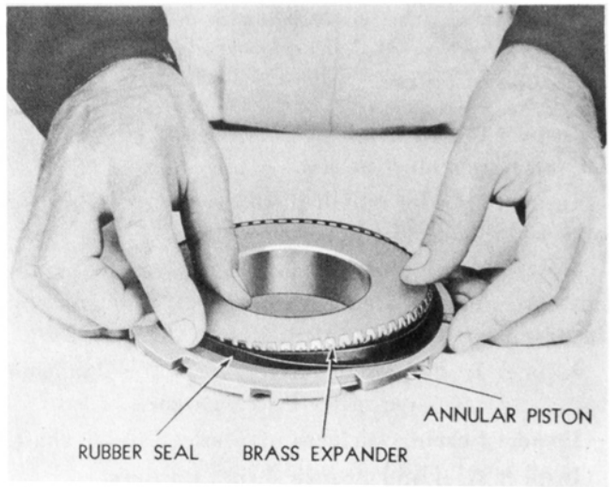


FIGURE 162—*Installing Piston Seal and Expander.*

Install piston into clutch drum resting on outer rubber seal. Align square notches in piston with holes in drum. While applying slight hand pressure to piston, guide seal into bore with the flat side of blunt screwdriver (Fig. 163).

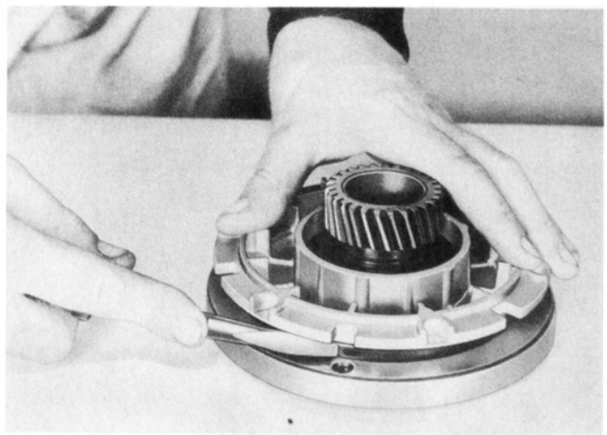


FIGURE 163—*Installing Annular Piston.*

Install clutch drum and piston assembly over front planet carrier into front unit drum.

CAUTION: *Be sure clutch release springs enter into recesses of annular piston.*

Lift front unit assembly off of planet carrier, place in press and press clutch drum below snap ring groove. Install clutch drum snap ring, positioning gap of ring between two drive pin holes (Fig. 164).

CAUTION: *Snap ring must be well seated into groove to prevent interference with ledge on drum.*

Release press and remove assembly.

Tap front face of center gear with a rawhide or similar hammer so the clutch drum will seat against snap ring (Fig. 165).

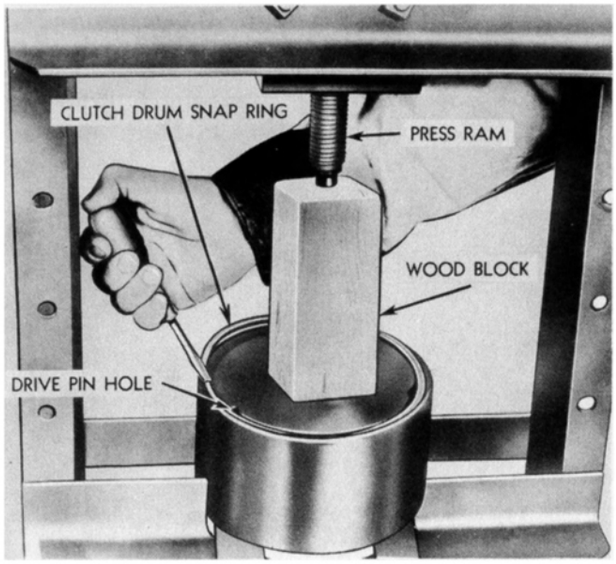


FIGURE 164—*Clutch Drum Snap Ring.*

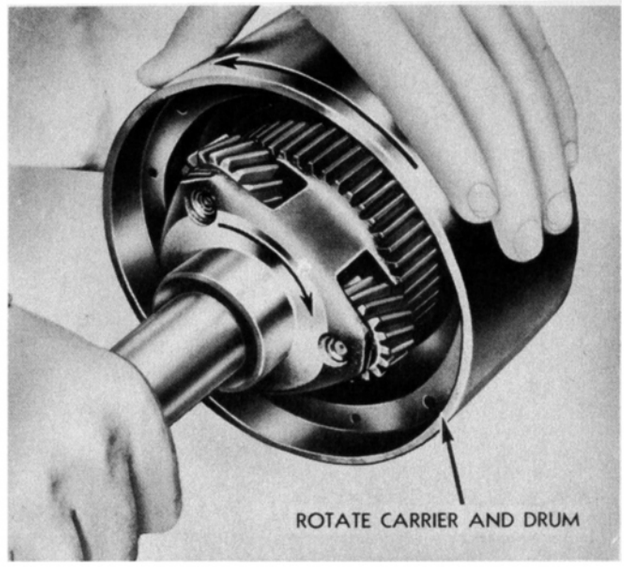


FIGURE 166—*Aligning Clutch Plates.*

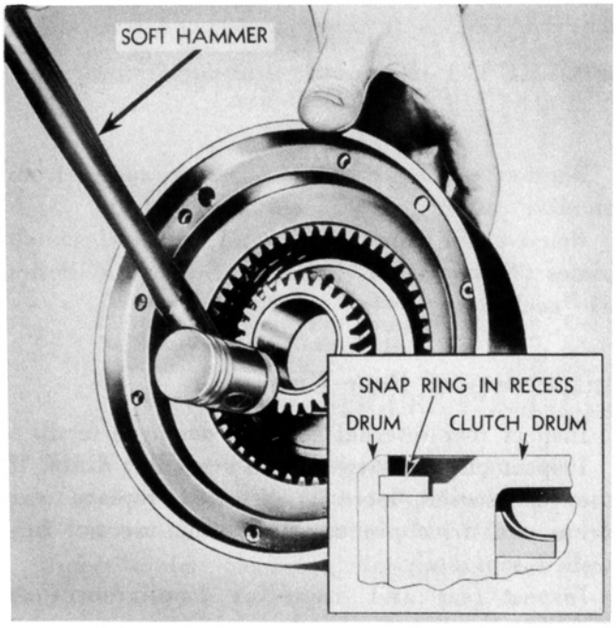


FIGURE 165—*Seating Clutch Drum Against Snap Ring.*

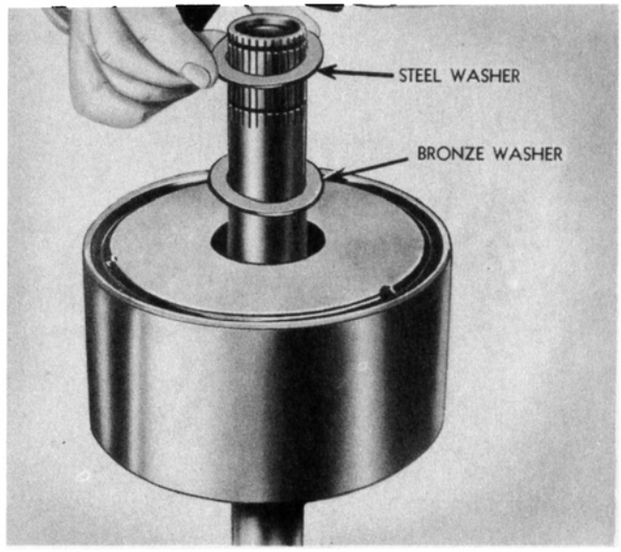


FIGURE 167—*Installing Front Unit Thrust Washers.*

Remove planet carrier from holding fixture and insert planet carrier into drive plates and drum by rolling drum on bench while pressing carrier firmly into the plates (Fig. 166).

Place planet carrier and drum assembly into holding fixture.

Install bronze then steel thrust washer over planet carrier (Fig. 167).

NOTE: *Locating lug on steel washer must fit over flat portion of planet carrier.*

Install snap ring over planet carrier into groove above steel washer.

CAUTION: *Do not allow snap ring to score bearing surface of planet carrier.*

Disassembly of Rear Unit

Remove rear clutch hub retainer tool J-2174 from rear unit drum.

Remove rear clutch hub and bronze thrust washer.

Remove two fillister head screws attaching rear internal gear to drum (Fig. 168).

Remove clutch release springs and guide pins. Separate springs and guide pins. Separate springs for inspection (Fig. 169).

Remove clutch drum retainer ring.

Separate drums by tapping lightly on clutch drum rear thrust face with block of wood (Fig. 170).



FIGURE 168—*Removing Rear Internal Gear.*

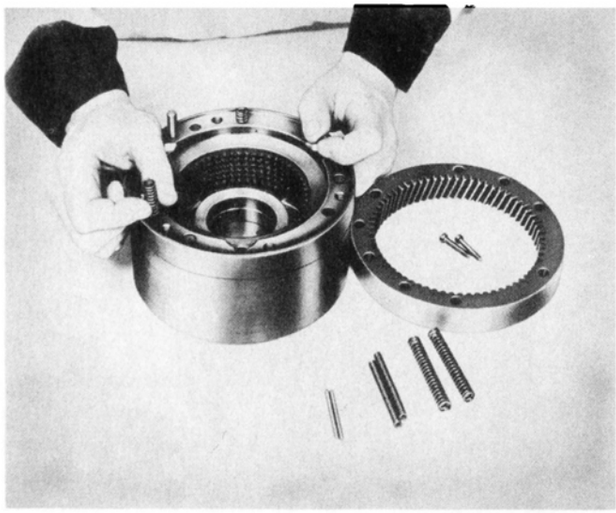


FIGURE 169—*Removing Clutch Release Springs and Guide Pins.*

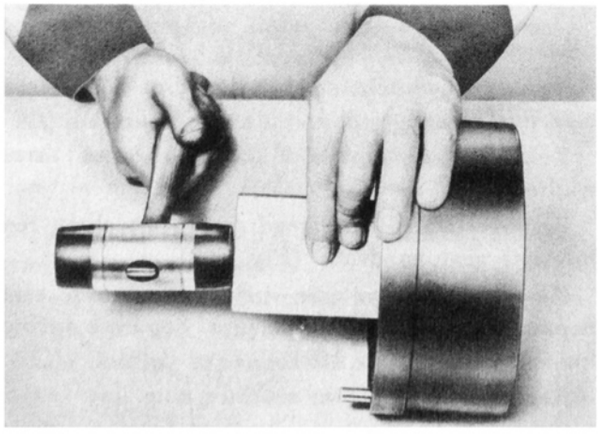


FIGURE 170—*Removing Rear Unit Clutch Drum.*

NOTE: *Do not damage teeth of composition clutch plates.*

Remove annular piston from clutch drum by tapping drum rear thrust face on block of wood (Fig. 171).

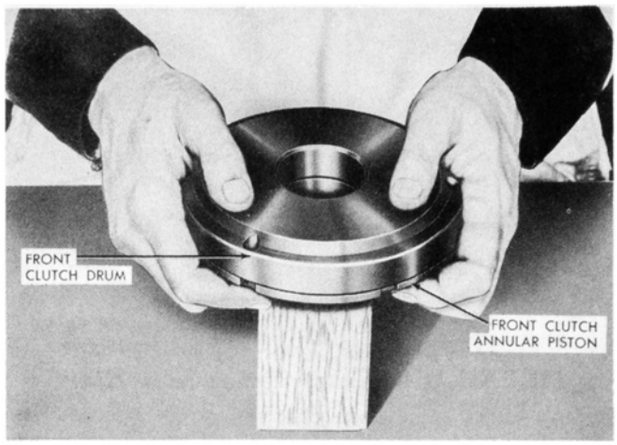


FIGURE 171—*Removing Annular Piston from Clutch Drum.*

Remove rubber seals and brass expanders from annular piston and rear unit clutch drum.

Remove six composition and six steel clutch plates ("Ambassador" Series) ("Statesman" Series five each).

Inspection of Rear Unit

Inspect rear internal gear for damaged teeth.

Inspect clutch drive pins in rear unit drum. If they are scored, loose or distorted, replace rear drum and drive pin assembly. Pins are not furnished separately.

Inspect rear unit drum for deep grooves or scores at band surface and clutch plate surface.

Inspect drive plates for damaged or loose facings.

NOTE: *If flakes of facing material can be removed by scratching the surface with the thumbnail, the plate should be replaced. Discoloration of drive plates is not an indication of failure.*

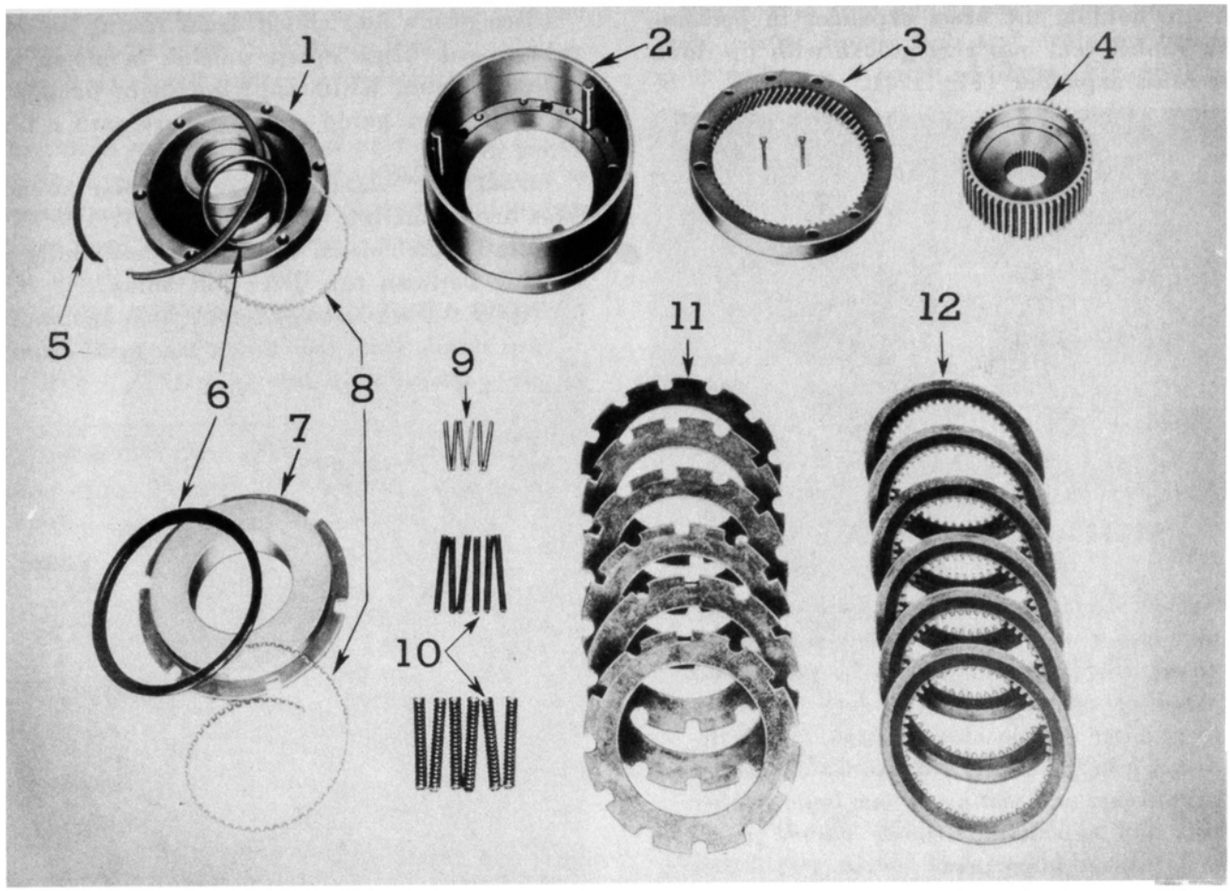
Inspect driven clutch plates for scored surfaces. Driven plates must be flat.

Inspect rear unit clutch drum for scores in piston bore and thrust surface.

Inspect surface of babbitt bushing in clutch drum.

Inspect annular clutch piston for scores. Be sure oil seal grooves are thoroughly clean.

Inspect clutch release springs for distortion or collapsed coils. Free length $2^{15}/_{64}$".



1. Rear Clutch Drum Assembly
2. Rear Drum and Pin Assembly
3. Rear Internal Gear
4. Rear Clutch Hub
5. Retaining Ring
6. Oil Seals
7. Clutch Annular Piston
8. Oil Seal Expanders
9. Release Spring Guide Pins
10. Clutch Release Springs
11. Clutch Driven Plates
12. Clutch Drive Plates

FIGURE 172—*Disassembled View of Rear Unit.*

NOTE: *Slight wear, "bright spots," on side of outer release springs indicating slight contact with drum is permissible.*

Inspect clutch release spring guide pins for distortion and length ($1\frac{5}{8}'' \pm .010''$).

Inspect front and rear thrust faces, internal and external splines. Blow out drilled passages on rear clutch hub.

Clean all parts thoroughly. Make a list of those to be replaced.

Assembly of Rear Unit

Place rear unit drum less internal gear on the bench with drive pins up.

Install six drive and six driven plates into drum ("Ambassador" Series) (five each on the "Statesman" Series) alternating plates. Apply Hydra-Matic Fluid to face of each plate as assembled.

NOTE: *Start with a drive (composition) and finish with a driven (steel) plate. Assemble driven plates with square notches over drive pins (Fig. 173).*

Position new inner rubber seal on inner piston of clutch drum above groove.

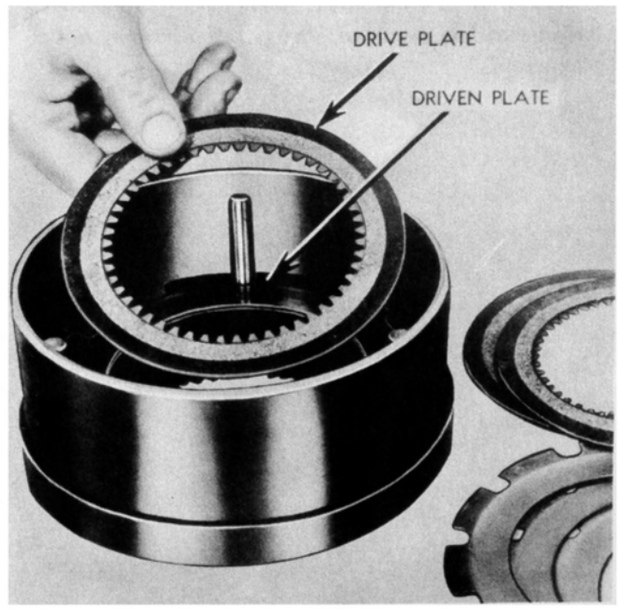


FIGURE 173—*Assembling Clutch Plates.*

Install new small brass expander into ring groove of clutch drum with expanding lips down.

While holding the brass expander in position, work rubber seal into ring groove with lip down over brass expander (Fig. 174).

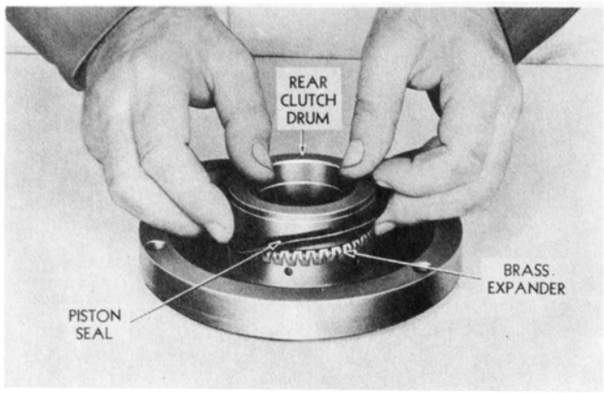


FIGURE 174—*Installing Rubber Seal Over Brass Expander.*

NOTE: *Work expander well back into position under seal so brass edges are not exposed. Hold brass expander in place with piece of masking tape. Before replacing large outer seal on clutch piston, install the piston into the clutch drum to insure proper installation and seating of new inner rubber seal and expander. Remove clutch piston and inspect inner seal.*

Place new large rubber seal over rear annular piston beyond seal groove.

Install new large brass expander in piston groove with lips up.

While holding expander in position, work rubber seal with lip up well into the groove.

NOTE: *Work expander well back into position under seal so brass edges are not exposed.*

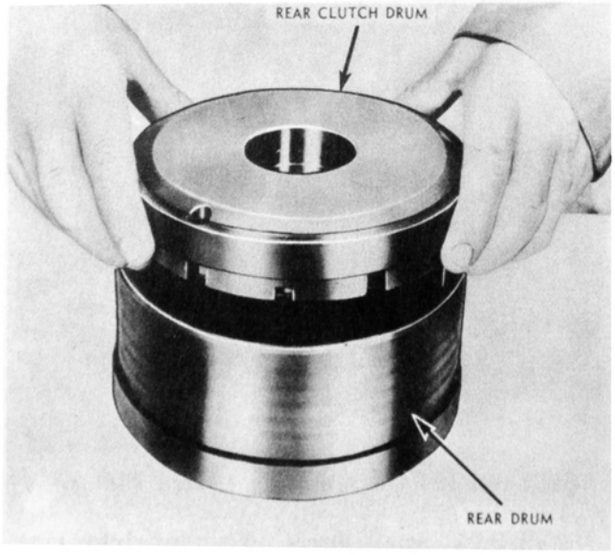


FIGURE 175—*Installing Rear Clutch Drum.*

Place piston into clutch drum resting on outer rubber seal. Align square notches in piston with holes in drum. While applying slight hand pressure to piston, guide seal into bore with a blunt screw driver.

Install rear clutch drum and piston assembly over drive pins into drum (Fig. 175).

Install clutch drum snap ring, positioning gap of ring between two drive pin holes.

NOTE: *With a wood block and hammer, tap clutch drum rear thrust face until drum seats against snap ring (Fig. 176).*

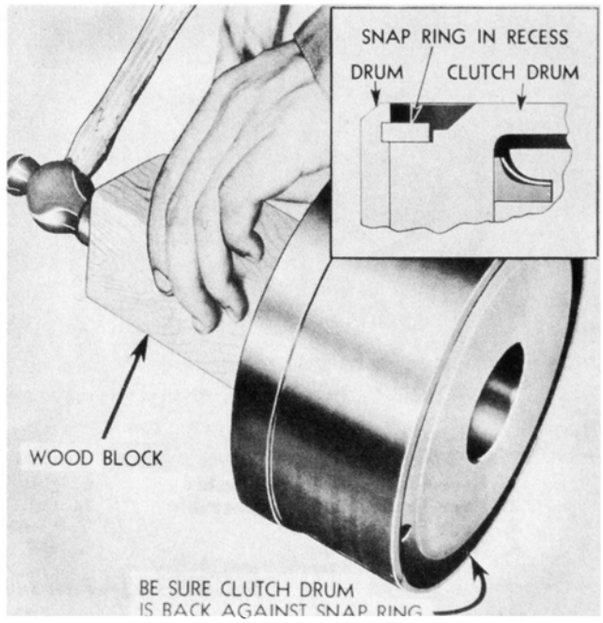


FIGURE 176—*Seating Clutch Drum Against Snap Ring.*

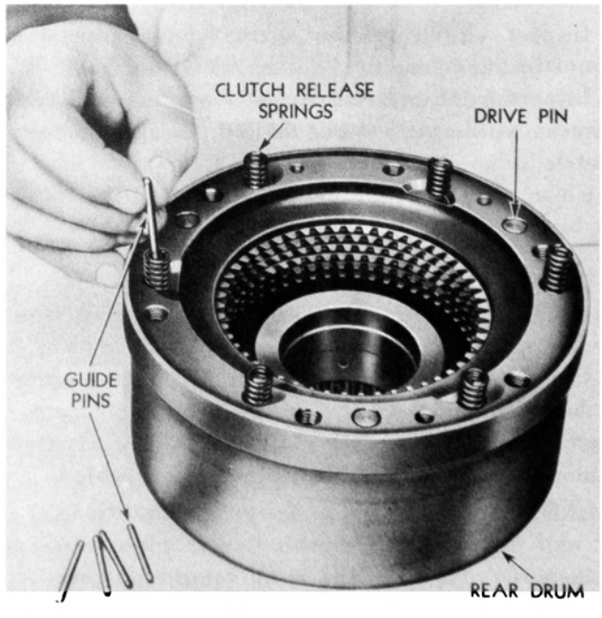


FIGURE 177—*Installing Clutch Release Springs and Guide Pins.*

Install six outer and six inner clutch release springs into recesses in piston.

Install six clutch release spring guide pins (Fig. 177).

Assemble rear unit internal gear to rear drum. Use two reverse flange attaching bolts to position internal gear to drum. Install and tighten two fillister head screws and then remove the two reverse flange attaching bolts.

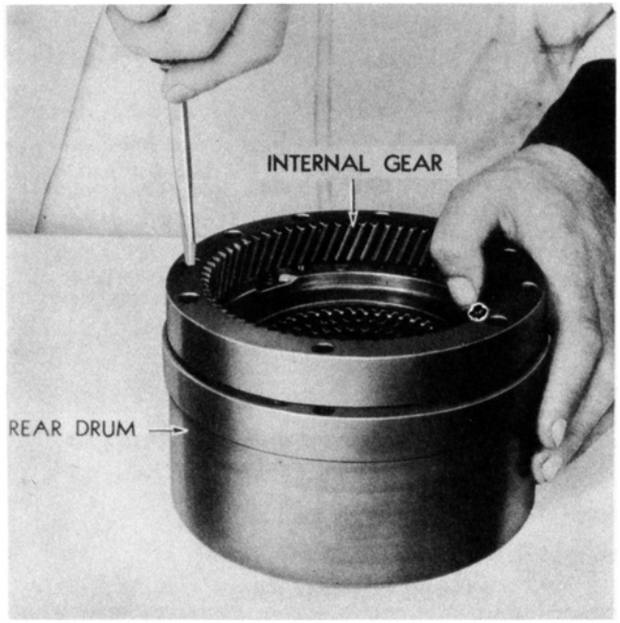


FIGURE 178—*Assembling Internal Gear to Rear Drum.*

Install front bronze thrust washer into deep counterbore in rear clutch hub and retain with petrolatum (Fig. 179).

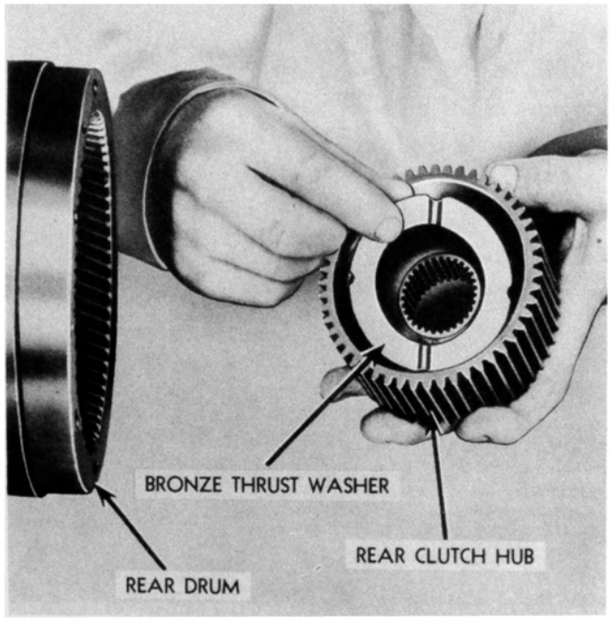


FIGURE 179—*Installing Rear Clutch Hub Front Thrust Washer.*

Install rear hub and thrust washer into clutch drive plates. Rotate hub and drum on bench to mesh splines with teeth of plates (Fig. 180).

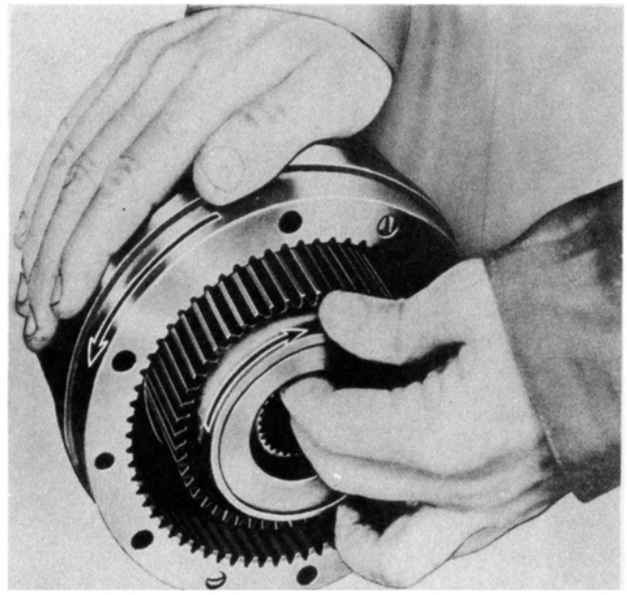


FIGURE 180—*Installing Rear Clutch Hub.*

Install rear clutch hub holding tool J-2174 on rear drum to hold hub in place. Use one reverse drive flange attaching bolt to hold tool (Fig. 181).

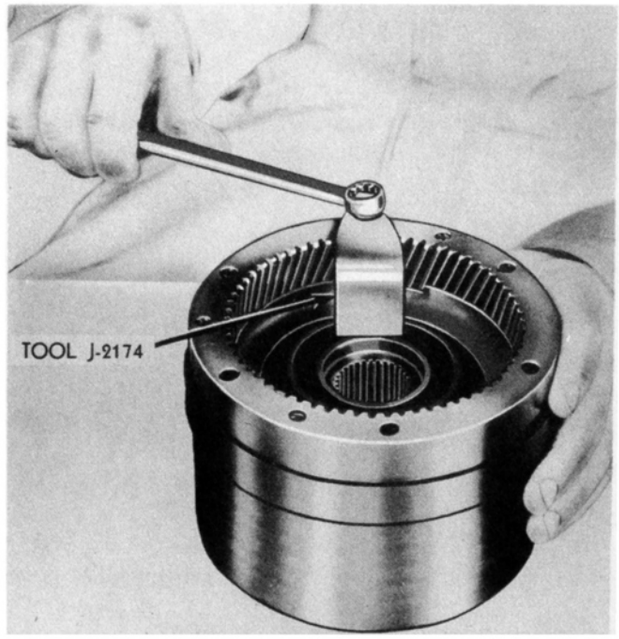


FIGURE 181—*Installing Rear Hub Tool.*

Install oil delivery sleeve over planet carrier with the long end of the bearing up. Compress exposed oil delivery sleeve rings with ring compressor J-1537. Tap oil delivery sleeve into bore

of front clutch drum with rawhide or similar hammer (Fig. 182).

Install rear clutch hub front snap ring into second groove on planet carrier.

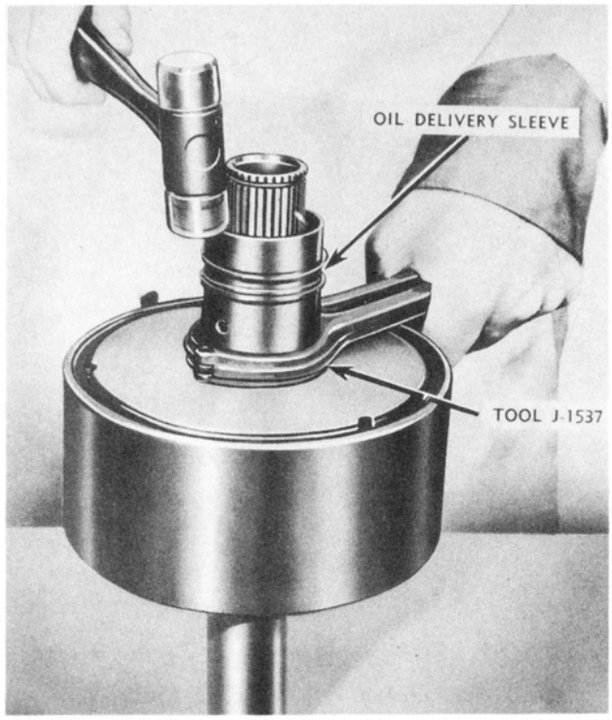


FIGURE 182—*Installing Oil Delivery Sleeve.*



FIGURE 183—*Installing Rear Clutch Hub Rear Snap Ring.*

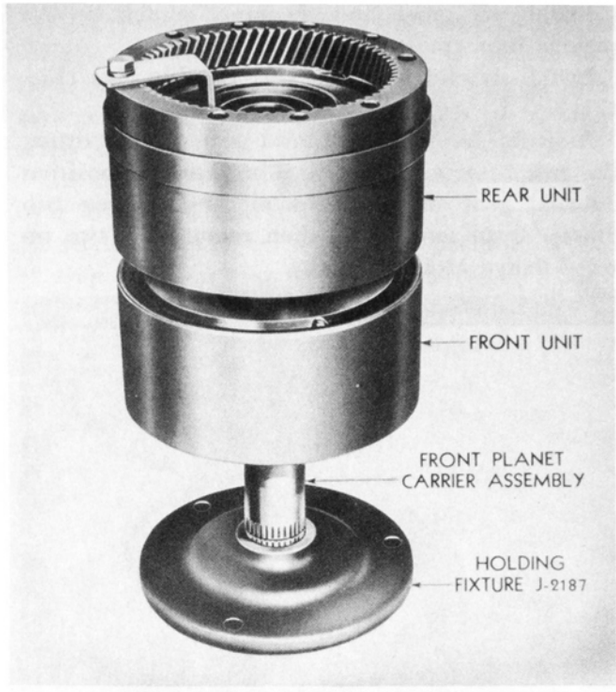


FIGURE 184—*Front and Rear Units In Holding Fixture.*

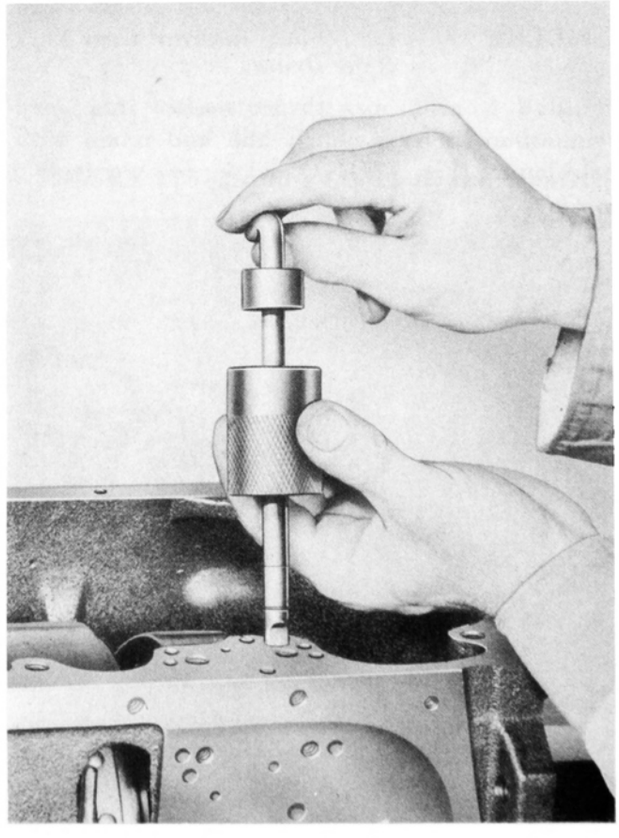


FIGURE 185—*Remove Line Exhaust Valve Sleeve.*

Compress exposed oil delivery sleeve rings and install rear unit drum assembly on planet carrier.

Install rear clutch hub rear snap ring (Fig. 183).

NOTE: *Both the front drum and rear drum should be free to rotate under slight force. If either drum binds, the unit should be disassembled and the cause of trouble corrected.*

Remove Line Exhaust Valve

Remove line exhaust valve sleeve from the transmission case using tool J-5177 (Fig. 185).

Remove exhaust valve and spring by applying air pressure at main line oil hole passage on side of case.

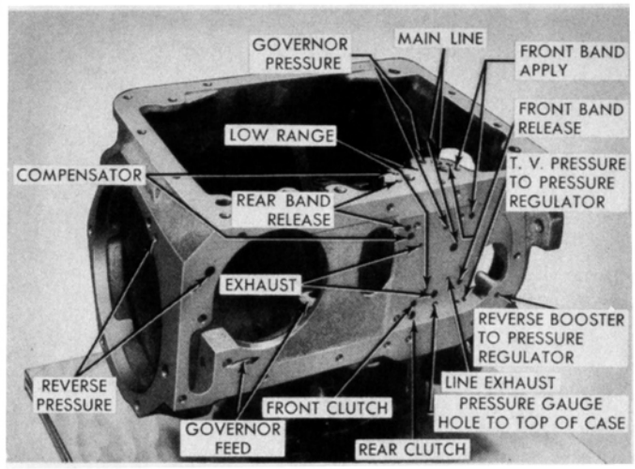


FIGURE 186—*Location of Oil Hole Passages.*

ASSEMBLY OF UNITS INTO TRANSMISSION CASE

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ASSEMBLY OF UNITS INTO CASE

Remove front and rear units from holding fixture and position front band over front of front unit drum so short anchor end will be positioned to fit over adjusting screw when units are placed in the case. Install spring or wire to hold front band on front drum.

Install front and rear units in case by lowering front end of planet carrier into case first (Figs. 187 and 188).

NOTE: *Make sure single hole in oil delivery sleeve is centered between center bearing cap attaching bolt holes and is facing up.*

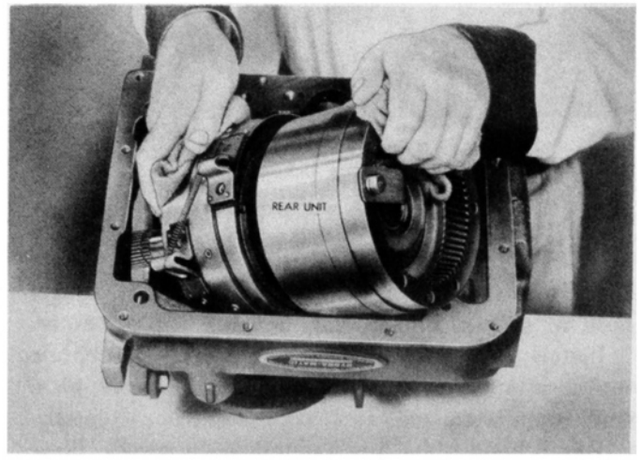


FIGURE 187—*Installing Units in Case.*

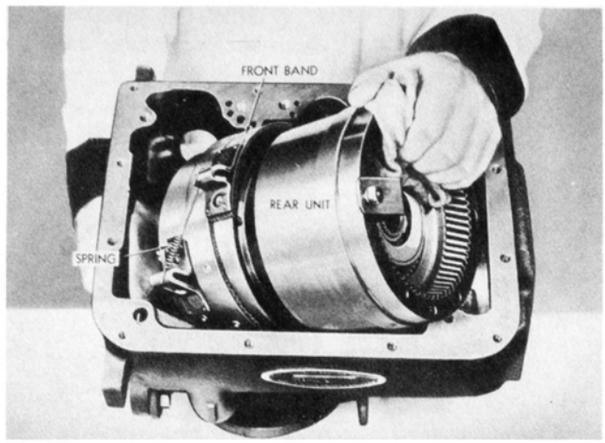
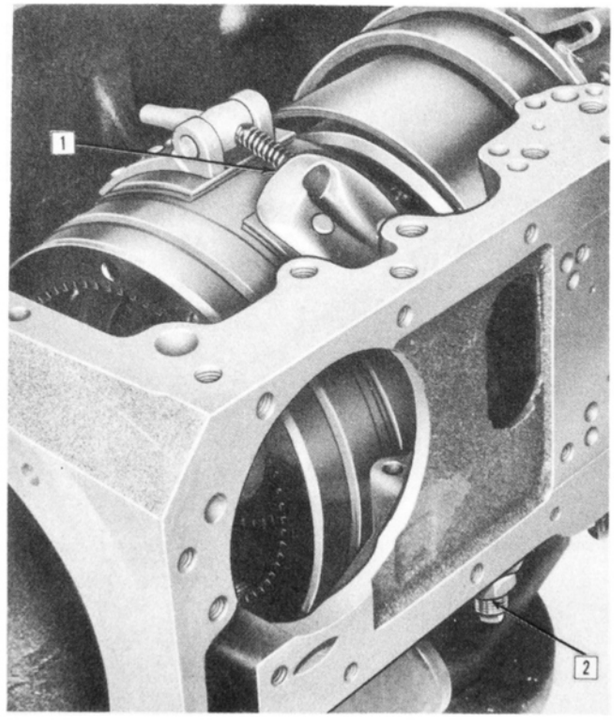


FIGURE 188—*Installing Units in Case.*

Remove spring and position anchor end of band over adjusting screw.

Install rear band on rear unit drum. Install rear band release spring in rear band and position anchor end of band over adjusting screw (Fig. 189).



1. Band Release Spring
2. Adjusting Screw

FIGURE 189—*Front Band and Release Spring.*

Position center bearing cap over oil delivery sleeve with dowel registering with single dowel hole in sleeve. Lightly tap bearing cap in place.

Install a new center bearing cap lock plate under attaching bolts and tighten bolts to 40-50 foot pounds torque.

Bend lock plate up around bolts using large pliers.

CAUTION: *Do not use a screw driver to pry corners of lock plate up as this may damage lapped edges of transmission case.*

Install screw driver between the center bearing cap and rear clutch drum to prevent the drum from moving forward. The screw driver should be placed at an angle to prevent damage to the oil delivery sleeve.

Remove rear clutch hub holding tool from rear drum.

Position rear clutch hub rear thrust washer in the counterbore of rear hub and retain with petrolatum (Fig. 190).

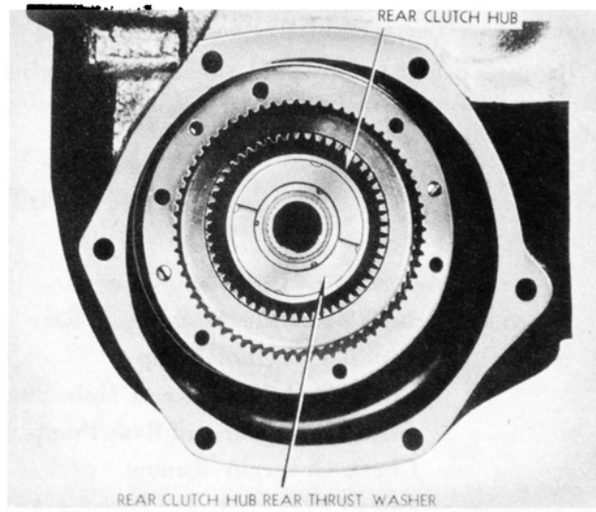


FIGURE 190—*Installing Rear Clutch Hub Rear Thrust Washer.*

Install correct size selective washer in counterbore of output shaft and retain in place with petrolatum (Fig. 191).

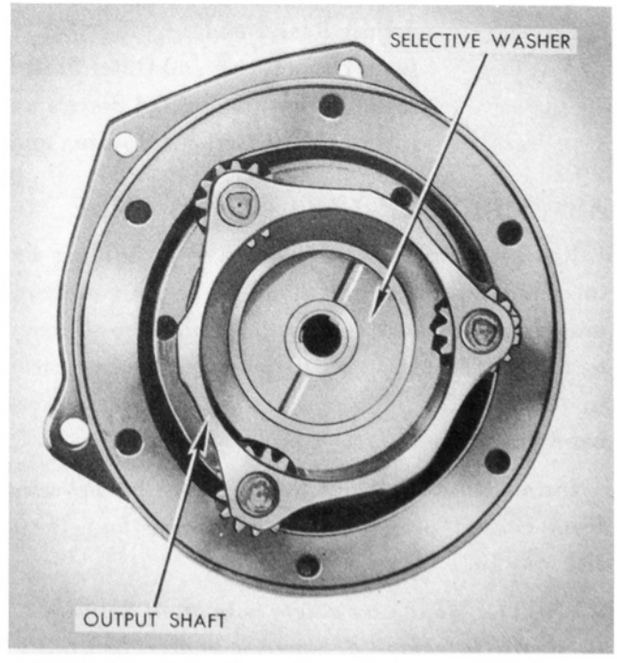


FIGURE 191—*Installing Selective Washer.*

NOTE: *If main shaft did not have correct end clearance prior to disassembly, select proper washer to bring end clearance within limits of .004" to .015".*

Selective washers are furnished in the following eight sizes:

MARK	SIZE
1	.055"—.059"
2	.063"—.067"
3	.071"—.075"
4	.079"—.083"
5	.087"—.091"
6	.095"—.099"
7	.103"—.107"
8	.111"—.115"

Install Reverse Assembly in Case

Position gasket on rear bearing retainer.

Install main shaft in output shaft meshing center gear with planet pinions.

Install main shaft and reverse assembly into rear end of transmission case aligning stationary cone lock key into keyway in case. Then align rear bearing retainer bolt holes to case (Fig. 192).

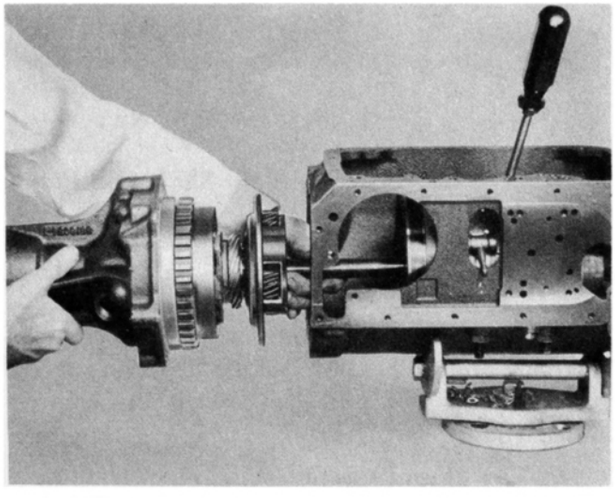


FIGURE 192—*Installing Main Shaft and Reverse Assembly.*

CAUTION: *Tighten the six bolts evenly without distorting flange. While tightening bolts, test for freeness by holding output shaft and turning main shaft.*

NOTE: *Revolve output shaft to facilitate meshing planet gears with drum internal gear.*

Just start five rear bearing retainer to case attaching bolts with lock washers. Also start parking brake pawl support bolt and lock.

Align holes in reverse drive flange and rear drum and install six reverse drive flange bolts and lock washers (Fig. 193). After two bolts are entered finger tight, remove screw driver.

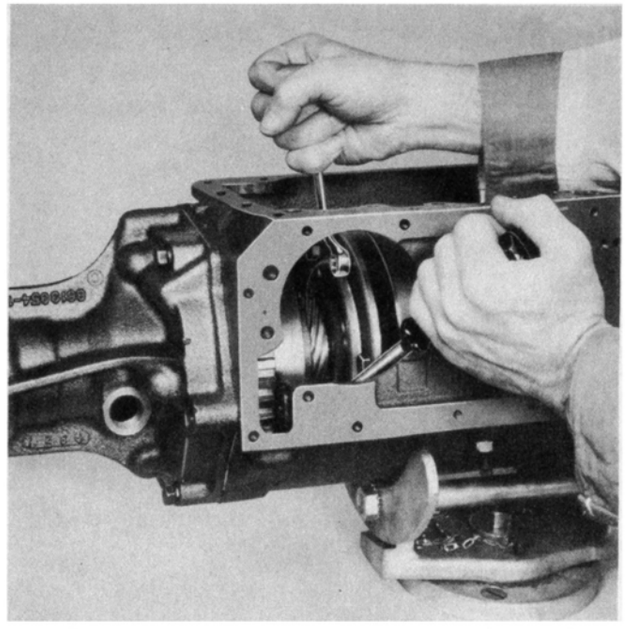


FIGURE 193—*Installing Reverse Drive Flange Bolts.*

Push or tap rear bearing retainer against case. Then tighten mounting bolts evenly. It is not necessary to tighten parking brake pawl support bolt at this time.

Test for freeness by turning main shaft, output shaft, and front and rear unit drums.

Install rear bearing retainer oil seal using tool No. J-1354.

Position bronze thrust washers over planet carrier shaft.

Position front oil pump gasket over front pump cover.

Install Front Oil Pump

Install front pump and front drive gear assembly over planet carrier (Fig. 194).

Align locating counterbore in pump cover with counterbore in case. Install pump cover locating washer in counterbore (Fig. 195).

Install two front pump attaching bolts and tighten bolts to 10-12 foot pounds torque.

NOTE: *Cover should protrude .003" to .015" out of case. If cover protrudes less than .003", add a pump cover gasket to allow cover to protrude within limits. After this check has been completed, loosen attaching bolts.*

Install the bronze, then steel thrust washer over planet carrier, against front end of front drive gear. These washers were tied together during disassembly.

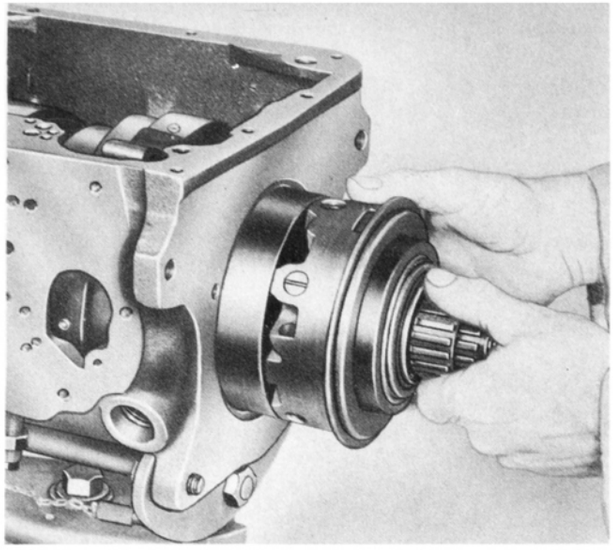


FIGURE 194—*Installing Front Pump and Front Drive Gear.*

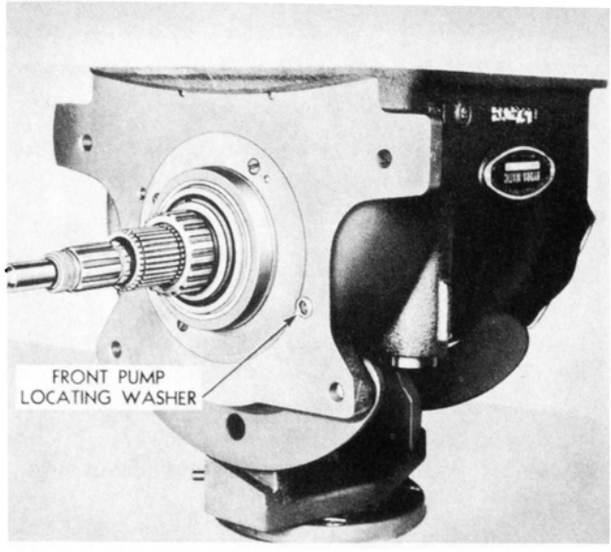


FIGURE 195—*Pump Cover Locating Washer Installed.*

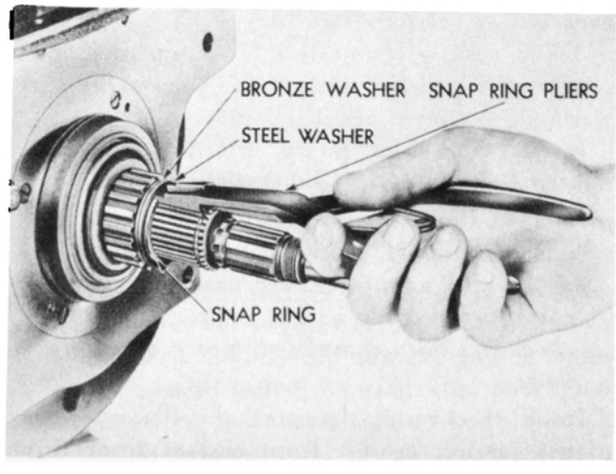


FIGURE 196—*Installing Front Drive Gear Snap Ring.*

Install snap ring holding thrust washers in place (Fig. 196).

Install open type snap ring in groove on main shaft.

Check End Clearance of Main Shaft

Install main shaft end play guide J-2587 over main shaft and front planet carrier to support main shaft.

Set up dial indicator on transmission case using tool J-1465 (Fig. 197).

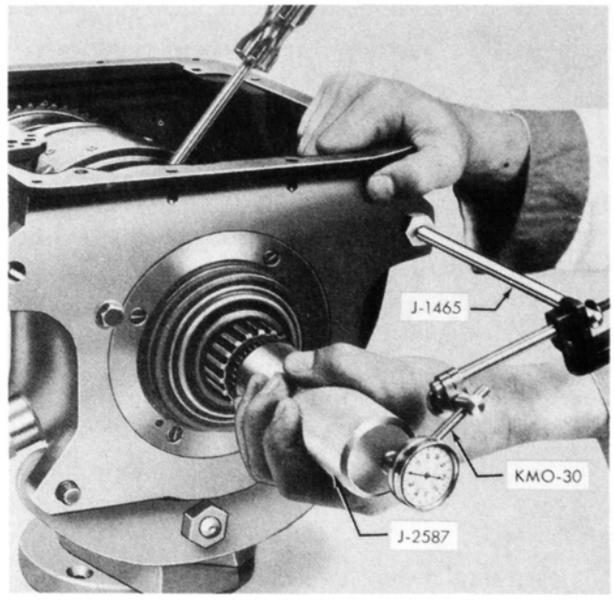


FIGURE 197—*Checking Main Shaft End Play.*

Insert screw driver between front clutch drum and center bearing cap holding the front planet unit forward.

Move main shaft back and forth (Fig. 197). End clearance should be .004" to .015". Be sure to get just float. Do not pull far enough to compress clutch release springs.

NOTE: *If end clearance is outside limits, disassemble and install correct selective washer.*

Remove screw driver from between front clutch drum and center bearing cap.

Remove dial indicator.

Install Governor and Rear Pump Assembly

Position the large round governor weight to the front of transmission and locate one reverse drive flange attaching bolt up to provide clearance for pump and governor assembly to slide into transmission case (Fig. 198).

Slide the pump and governor assembly into position in case and install and tighten two attaching bolts and lock washers 15 to 18 foot pounds torque.

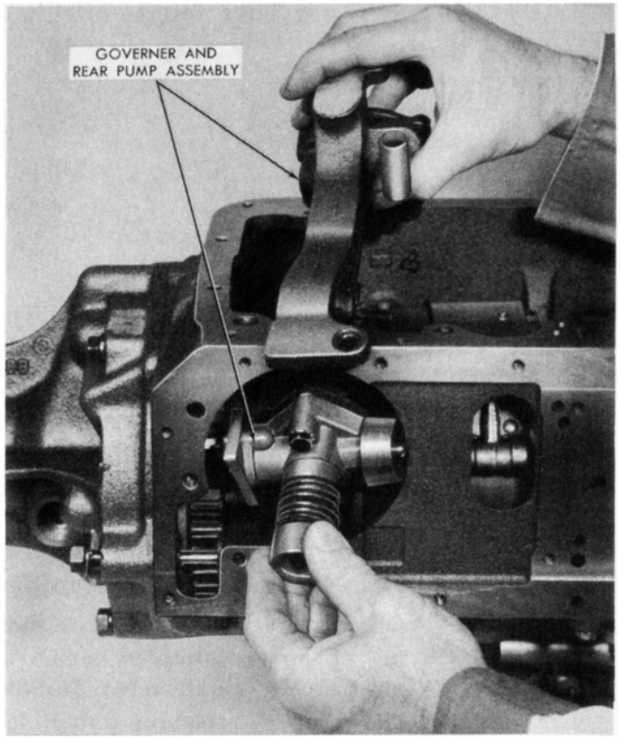


FIGURE 198—*Installing Governor and Rear Pump Assembly.*

Check Governor Runout

Install dial indicator and check governor runout at tower about ¼" from the end of the governor (Fig. 199).

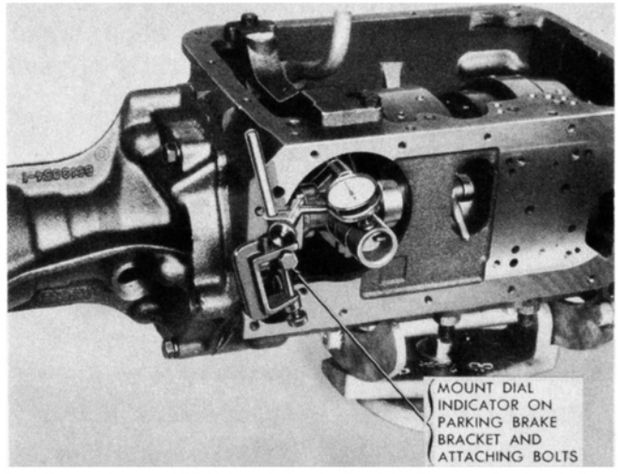


FIGURE 199—*Checking Governor Runout.*

Runout should not exceed .005". If runout exceeds .005", remove governor assembly and check runout of governor drive flange which should be less than .002". If flange is within .002", rotate governor 180°, assemble and recheck.

If governor does not exceed .005", no further correction is required. If governor runout still exceeds .005" after this check, it will be necessary to change the governor flange or rear pump assembly.

Install Parking Brake Bracket Assembly

Remove parking brake pawl support bolt from case. This bolt was previously installed to assure alignment of threads.

Install parking pawl into position in case and let pawl slide down in case. Do not install parking brake pawl support bolt at this time.

Place parking brake bracket over end of the governor and press gently (Fig. 200).

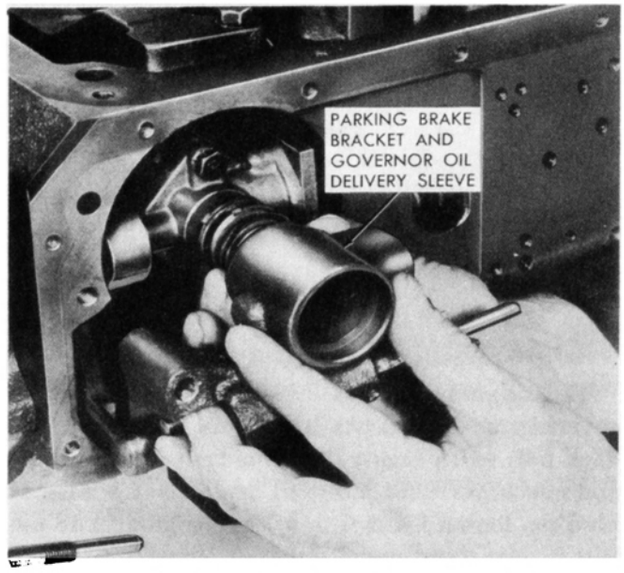


FIGURE 200—*Installing Parking Brake Bracket Assembly.*

Install the two attaching bolts with the parking blocker piston pin retainer on the lower bolt (Fig. 201).

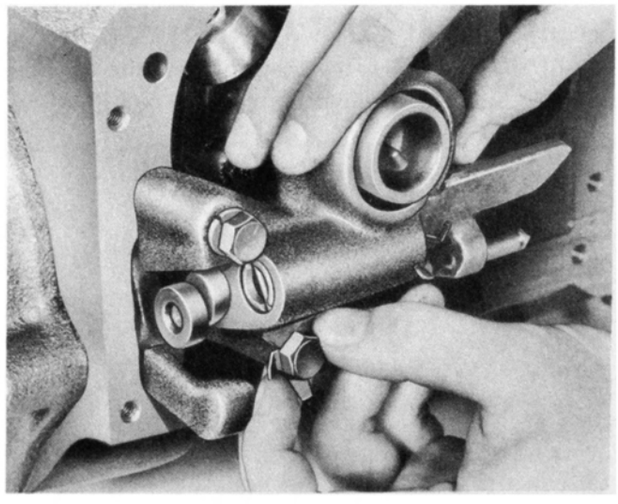


FIGURE 201—*Parking Blocker Piston Pin Retainer.*

Tighten assembly to case; then lift parking pawl in position and install the parking pawl pivot bolt. Install two oil delivery pipes and spring.

Install governor aligning tool J-4731 in place as shown in Figure 202.

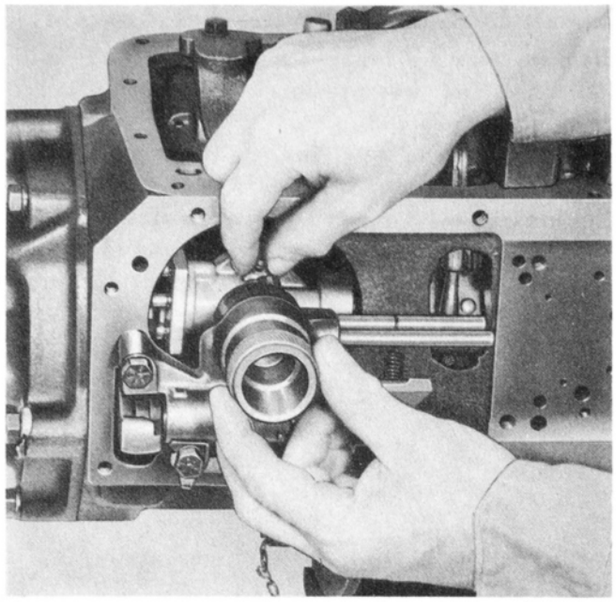


FIGURE 202—*Checking Governor Alignment.*

The aligning tool should rotate free and the governor should rotate freely as much as gear back lash will permit. Rotate output shaft ¼ turn and check governor and tool again for freeness. If binding, loosen bracket and/or rear pump and adjust to give free movement.

Recheck governor each ¼ turn for a complete revolution. Remove tool J-4731.

Install the reverse clutch oil delivery pipe.

Refer to Minor Services and Repairs for disassembly, inspection, and assembly of parking brake bracket assembly.

Install Control Valve Assembly

Install the control valve assembly on the two oil delivery and the reverse clutch pipes (Fig. 203).

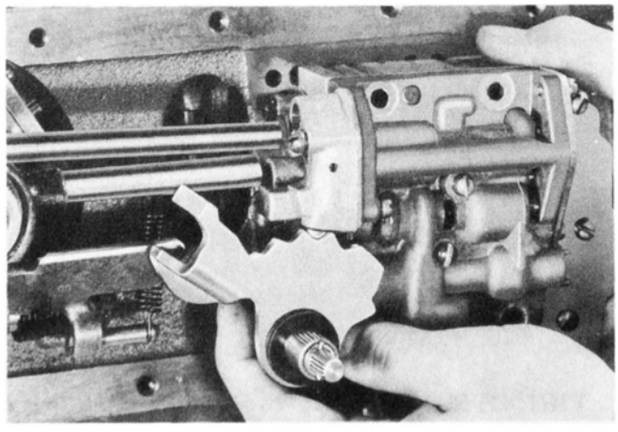


FIGURE 203—*Install Control Valve Assembly.*

Set inner detent control lever in "L" range and install the four attaching bolts and lock washers. Tighten the attaching bolts to 6-8 foot pounds torque.

Install the pressure regulator reverse oil pipe (Fig. 204).

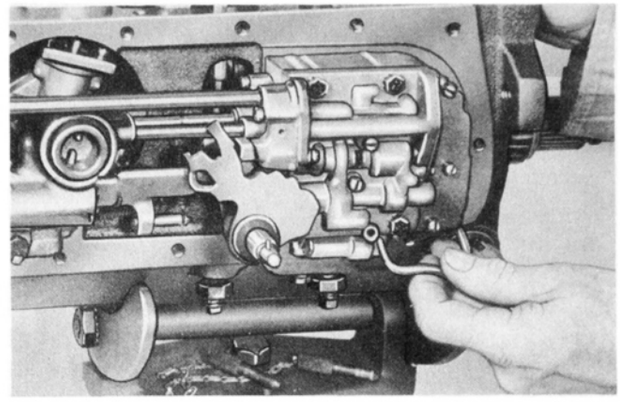


FIGURE 204—*Install Pressure Regulator Reverse Oil Pipe.*

Line Exhaust Valve and Spring Assembly

Inspect line exhaust valve for nicks or scores and check spring for distortion or collapsed coils.

Install spring in case and install valve. Install sleeve with recess toward the attaching bolt hole and tap in case with a soft hammer (Fig. 205).

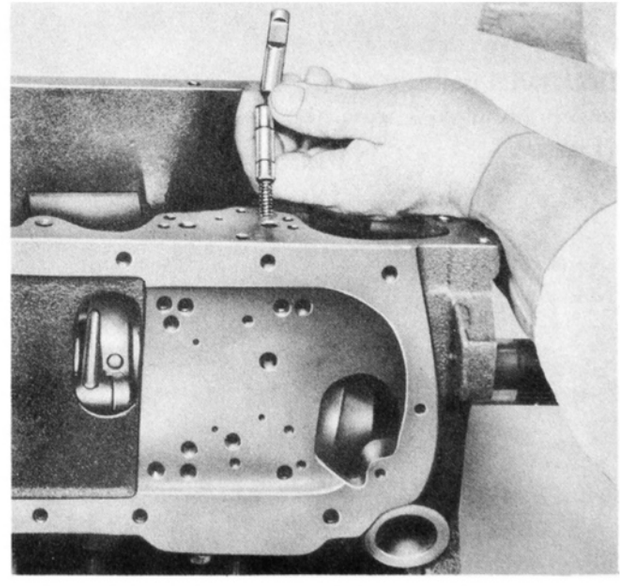


FIGURE 205—*Line Exhaust Sleeve, Valve, and Spring.*

Install Pressure Regulator Assembly

Place new gasket over pressure regulator plug.

NOTE: *Be sure to install the pressure regulator plug gasket with the seam toward the threaded end of the plug.*

With pressure regulator valve assembled into spring, locate valve on seat in front pump (Fig. 206).

Apply pressure on regulator plug and tighten in transmission case to 40-50 foot pounds torque.

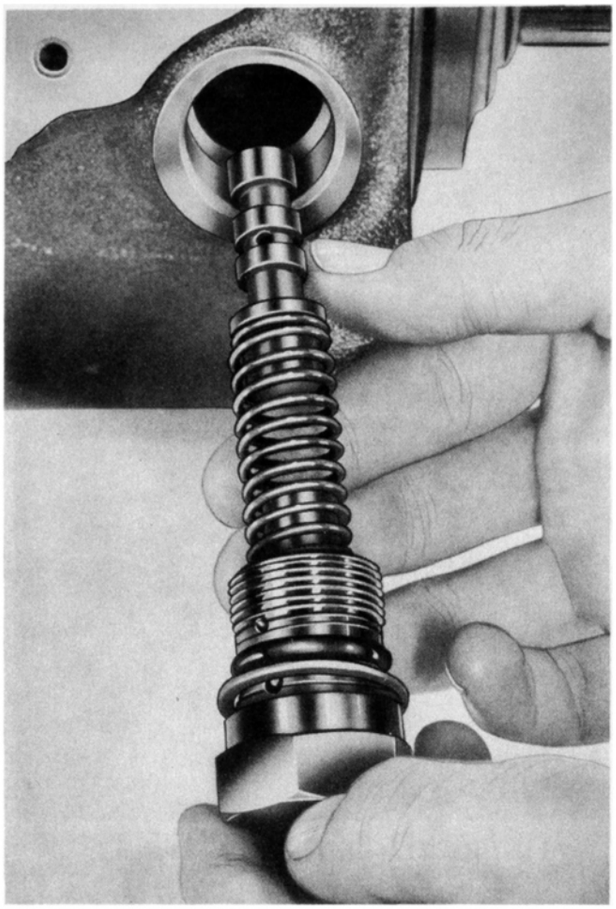
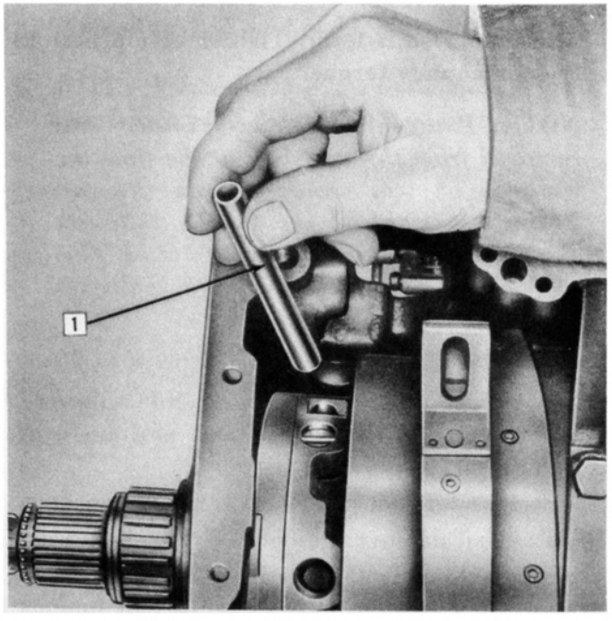


FIGURE 206—*Pressure Regulator Assembly.*

Front and Rear Servos

Install the front pump delivery pipe in front pump body (Fig. 207).



1. Front Pump Delivery Pipe

FIGURE 207—*Installing Front Pump Delivery Pipe.*

Install rear pump discharge pipe in hole in rear pump. Position front servo with piston stem in socket on end of front band; place servo on front pump delivery pipe and insert rear pump discharge pipe in servo and lower to case (Fig. 208).

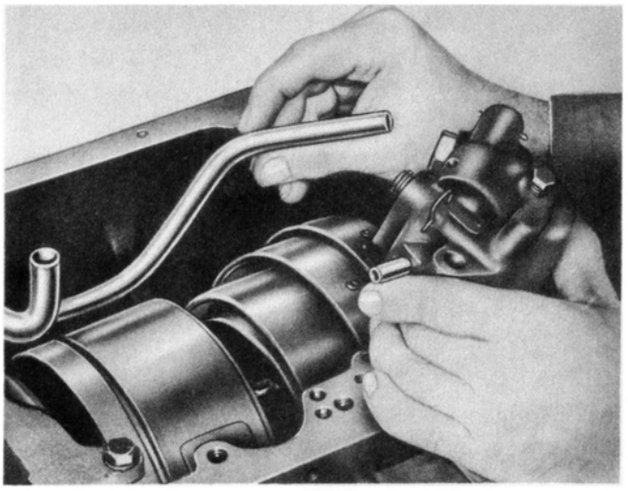


FIGURE 208—*Installing Front Servo and Rear Pump Discharge Pipe.*

Enter front servo attaching bolts and lock washer approximately two or three threads.

Install rear servo by entering transfer pipe into rear servo body and install two rear servo attaching bolts. Tighten both front and rear servo bolts and torque to 23 to 28 foot pounds torque (Fig. 209).

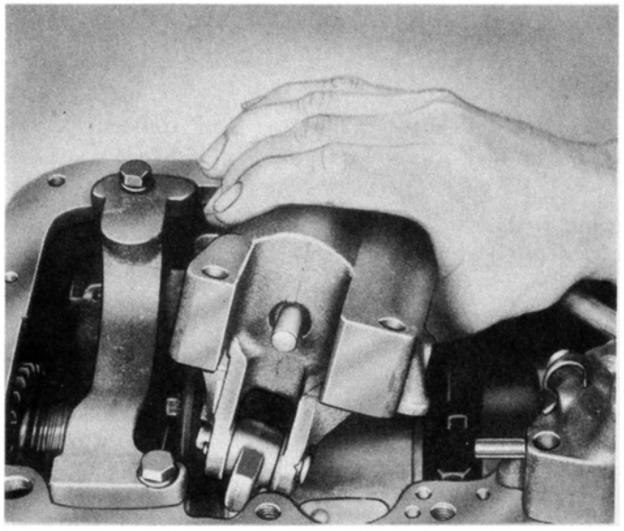


FIGURE 209—*Installing Rear Servo.*

Adjust Front Band

Remove the pipe plug from front servo using a 7/16" six point socket. Loosen "hex" adjusting screw of gauge J-1693 until approximately 1/8" of threads are exposed above gauge body. Install gauge tightening by HAND ONLY (Fig. 210).

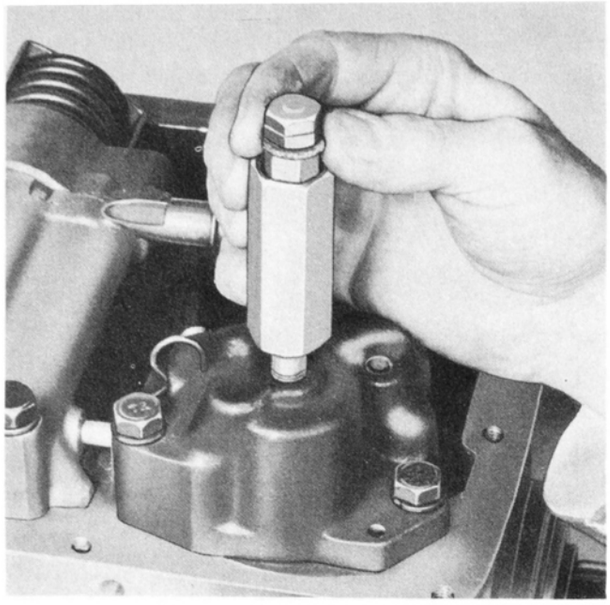


FIGURE 210—*Adjusting Front Band.*

Tighten the "hex" adjusting screw with fingers until the stem of gauge is felt to JUST touch piston in front servo.

NOTE: *Before tightening adjusting screw, be sure band is centered on drum.*

Using a wrench, tighten the "hex" adjusting screw five complete turns from the point where it was felt, by hand, that the stem JUST touched the piston.

Tighten front band adjusting screw until knurled washer on top of the band adjusting gauge is just free to turn.

Hold band adjusting screw and tighten band adjusting lock nut securely to 40 to 50 foot pounds torque.

Loosen "hex" adjusting screw at least five full turns and remove gauge. Install and tighten pipe plug.

Adjust Rear Band

With rear band centered on drum, tighten band adjusting screw until actuating lever contacts face of gauge J-5071 (Fig. 211).

CAUTION: *Do not go beyond adjustment. If adjusting screw is accidentally turned beyond adjustment, loosen two or three turns and repeat adjustment.*

Hold band adjusting screw and tighten adjusting screw lock nut to 40 to 50 foot pounds torque.

Install Side Cover and Outer Shift Lever

Place a new gasket on side cover and retain in place with petrolatum.

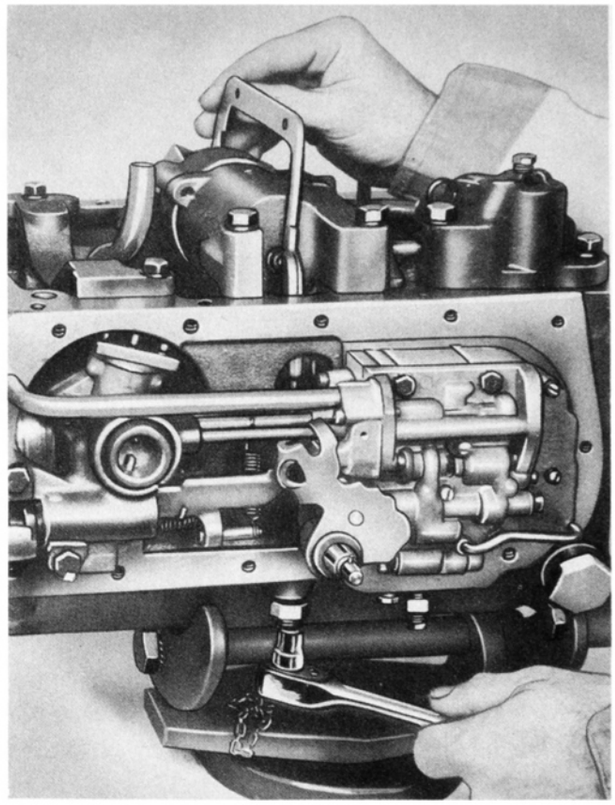


FIGURE 211—*Adjusting Rear Band.*

Position side cover and gasket assembly over manual shaft.

Install side cover attaching bolts and washers with new COPPER WASHERS on lower bolts finger tight. Shift cover to centralize manual shaft in hole and tighten bolts 10 to 12 foot pounds torque.

Install outer shift lever. Tighten clamp bolt 10 to 13 foot pounds torque.

NOTE: *Throttle control lever (outer) was removed from throttle shaft at the time the transmission was removed from the car. Throttle control lever should be installed on shaft after the transmission is installed. This will prevent accidentally bending the lever.*

Install Transmission Oil Screen and Pan

Install front pump intake pipe and slide oil screen over front pump intake pipe and position over rear pump intake pipe.

Place new oil pan gasket on transmission case.

Position oil pan over gasket.

Start attaching bolts with lock washers to line up pan. Then tighten bolts 10 to 13 foot pounds torque.

Install new oil pan drain plug gasket and tighten plug 35 to 45 foot pounds torque.

NOTE: *Soak new gasket until it is sufficiently pliable to install on drain plug and allow to dry. Do not enlarge hole of gasket.*

Install Rear Flywheel Housing and Torus Members

Position rear flywheel housing on front of transmission and install attaching bolts and lock washers. Tighten 40 to 50 foot pounds torque.

Position the two oil seal rings in the pump cover so that the gap in the rings is at the top at the time of installation of the torus cover. This will prevent the possibility of ring breakage when cover is installed.

Apply a light film of lubriplate to the outside cover hub and install torus cover on splines of front drive gear. Push cover evenly without rocking to prevent damage to oil seal and rings.

Install drive torus on splines of front planet carrier and install snap ring.

Move shift lever into reverse position.

Install a NEW main shaft nut lock plate (place projection over flat on torus hub) and install main shaft nut. Tighten 50 to 60 foot pounds torque.

Bend lock plate up against nut.

Install plug between band adjusting screws.

Install oil level indicator.

INSTALLING HYDRA-MATIC TRANSMISSION

Thoroughly clean face of flywheel.

Place a new gasket on face of flywheel. To provide a good seal, it is very important that the gasket be in perfect condition and that the flywheel be free of any burrs. Gasket should be held in place with petrolatum. Do not use shellac or any other sealer.

Line up flywheel, with one of the dowel pins approximately 4″ below left side of front flywheel housing, so transmission main shaft can pass between two flywheel to crankshaft bolts.

Lift transmission into position with a hydraulic floor jack with tool J-2808 attached and with handle to the rear of car.

CAUTION: *Tool J-2808 must be securely fastened to jack pad to prevent slipping.*

NOTE: *While lifting transmission, guide main shaft pilot into pilot bushing.*



FIGURE 212—*Transmission on Tool J-2808.*

Push transmission forward until dowels of rear flywheel housing rest in holes of front housing. Install rear housing attaching bolts, studs, lock washers, and nuts. The lower two studs on each side of rear housing also hold the rear engine mountings to housing. Install mountings with these studs. Remove hydraulic jack.

Install 30 torus cover to flywheel bolts with lock washers finger tight.

NOTE: *Torus cover to flywheel bolts are alloy steel. No substitutes should be used.*

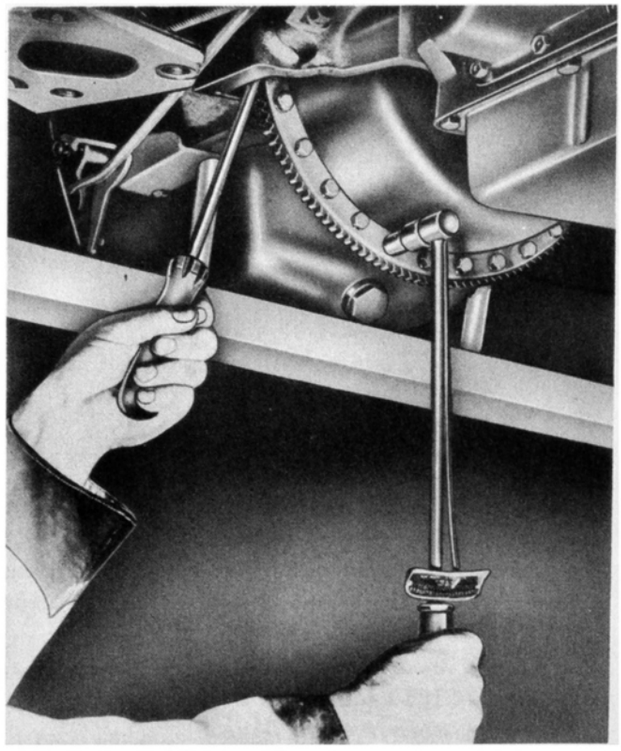


FIGURE 213—*Tightening Torus Cover to Flywheel Bolts With Torque Wrench.*

Tighten torus cover to flywheel bolts as follows:

Tighten two bolts adjacent to dowels 12 to 15 foot pounds torque.

Tighten two bolts located 90° from dowels 12 to 15 foot pounds torque.

Tighten all bolts in rotation 20 to 25 foot pounds torque.

Tighten all bolts in rotation 30 to 35 foot pounds torque.

Tighten torus cover and oil pan drain plugs.

Install flywheel housing bottom cover.

Install outer throttle control lever on transmission.

Install engine support cross member and supports.

Remove hydraulic jacks.

Install the propeller shaft and universal joint to the output shaft and connect the torque tube to the rear bearing retainer.

Connect the control rod to the shift lever.

Connect the throttle rod to the throttle lever.

Connect the speedometer cable and housing to the transmission adapter.

Connect the hand brake cable and adjust.

Install rear brake hose bracket.

Fill transmission with Hydra-Matic drive fluid. Follow instructions in "Minor Repair Section" listed under Fluid Capacity.

Test main line oil pressure. Refer to instructions outlined in "Trouble Diagnosis and Testing."

Install floor hole cover, mat, and accelerator pedal.

Adjust throttle control and shift control linkage. Refer to instructions outlined in "Adjustments With Transmission in Car."

Remove car stands and road test car. Use Hydra-Matic Diagnosis Guide.

REPAIRS

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REPAIRS

The procedures in this section are provided to take care of repair operations which may be found necessary during inspection.

REAR OIL PUMP REPAIR

To replace governor drive flange, rear oil pump and governor driven gear proceed as follows:

Grind off one end of each of lock pins holding governor drive flange and oil pump driven gear on shaft.

Drive pin through governor drive flange (Fig. 214) Tool J-2183-1 is helpful in this operation.

Remove governor drive flange.

Drive pin through pump shaft and driven gear.

Remove any burrs from shaft at pin holes; then remove shaft through gear and body.

To assemble new parts, slide the drive shaft and driven gear over shaft with teeth toward pump end of body; then enter shaft into governor end of body (Fig. 215).

Line up holes in gear and shaft and install a new pin.

Peen ends of pin to fill holes in shaft and gear (Fig. 216). Tools J-2183-1 and J-2183-2 are helpful in this operation.

CAUTION: *Height of peened ends of pins must not exceed .070".*

Install governor drive flange on end of shaft and peen a new pin as outlined above.

NOTE: *Complete assembly procedure is outlined in minor Services and Repairs.*

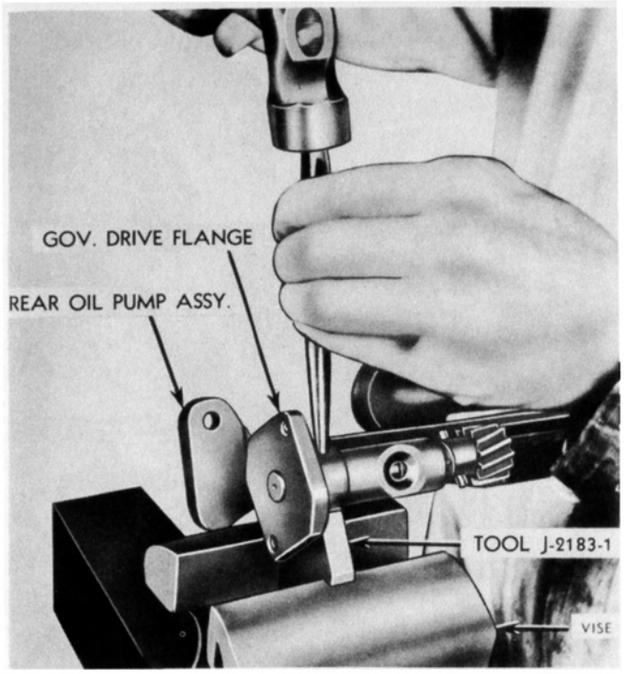


FIGURE 214—*Removing Governor Drive Flange.*

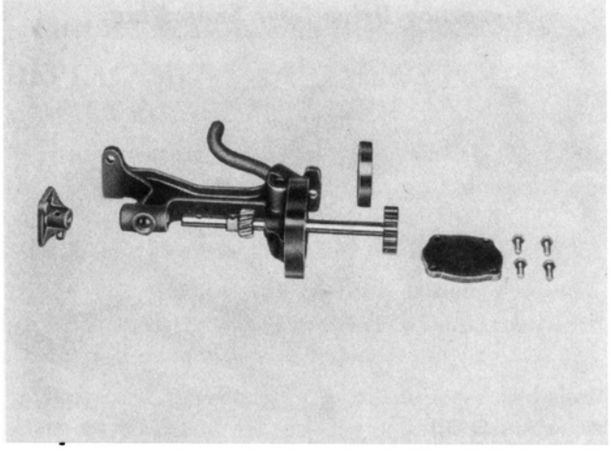


FIGURE 215—*Rear Pump Assembly.*

REPLACEMENT OF REAR SERVO ACCUMULATOR CHECK VALVE

When tests or inspection indicate that the rear servo accumulator check valve is at fault, it should be replaced as follows:

NOTE: *Accumulator body should be removed from the servo assembly as outlined in Minor Services and Repairs.*

Drive out rivet holding check valve in place.

Remove check valve and plunger.

Clean body and passages.

Install plunger.

Install check valve, placing notch in groove in plunger.

Insert new rivet through valve and into body and place body over steel bar in vise and peen rivet.

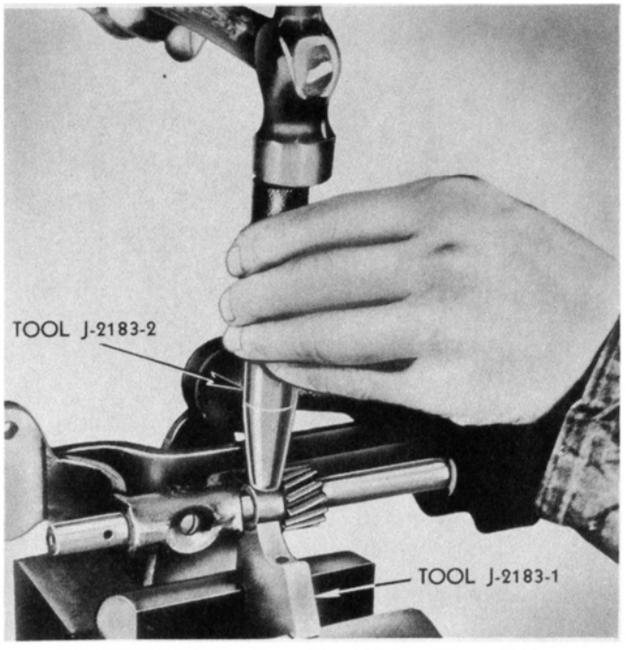


FIGURE 216—*Peening Drive Gear Pin.*

NOTE: *Small bleed hole in valve should be over hole in body.*

Check assembly by working plunger to be sure the plunger and flat check valve are free.

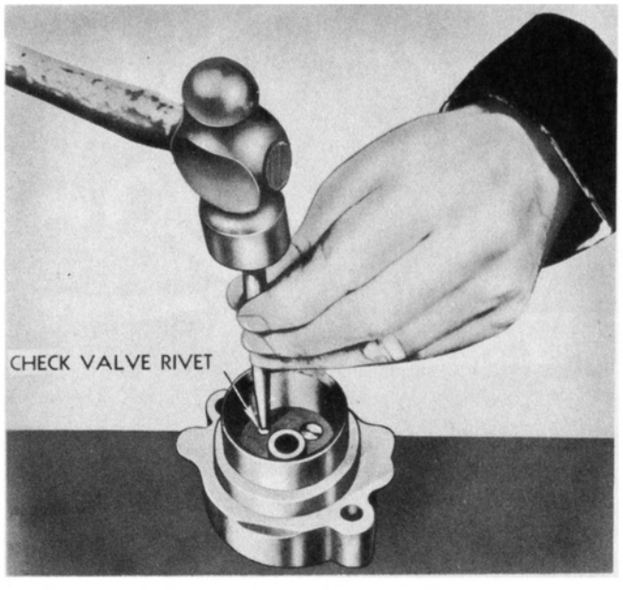


FIGURE 217—*Removing Check Valve Rivet.*

REPLACEMENT OF REAR OIL PUMP AND GOVERNOR DRIVE GEAR

When necessary to replace the rear oil pump and governor drive gear on the reverse planet carrier assembly, proceed as follows:

Remove snap ring (Fig. 220).

Place reverse planet carrier assembly in vise with soft jaws and saw the bronze gear between teeth, to within $\frac{1}{32}$" of hub, on the opposite side to the ball. Do not saw into hub.

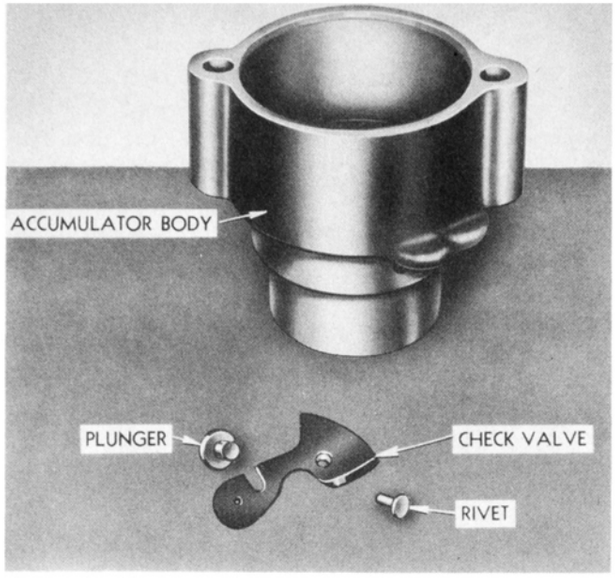


FIGURE 218—*Check Valve, Plunger and Rivet.*

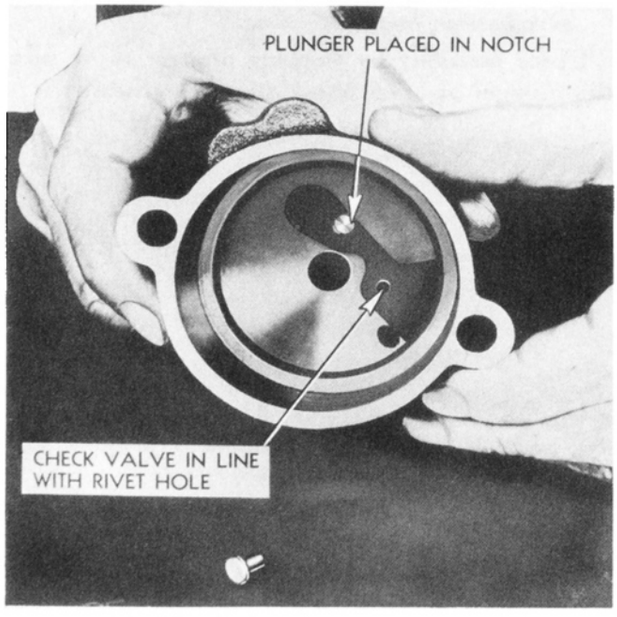


FIGURE 219—*Check Valve and Plunger in Body.*

Select a chisel with a blunt taper and remove gear by splitting in saw slot. Do not use a slender tapered chisel as hub may be damaged (Fig. 221).

Remove steel locating ball from hub.

Clean all parts thoroughly. Smooth surface where gear is to be installed. Make sure snap ring groove is clean and free of burrs.

Place locating ball in hub. Hold in place with petrolatum.

Place new gear on metal plate supported by two bricks. Heat gear with torch until it just begins to discolor or show traces of blue. Do not overheat (Fig. 222).

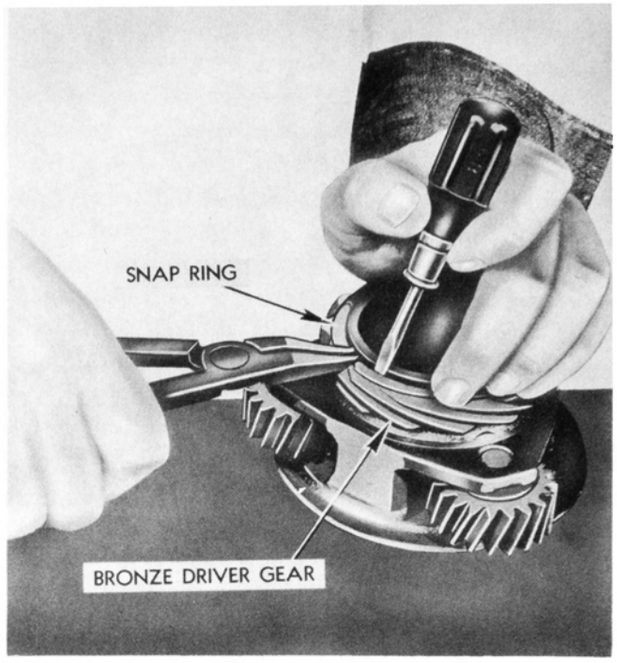


FIGURE 220—*Removing Oil Pump and Governor Drive Gear Snap Ring.*

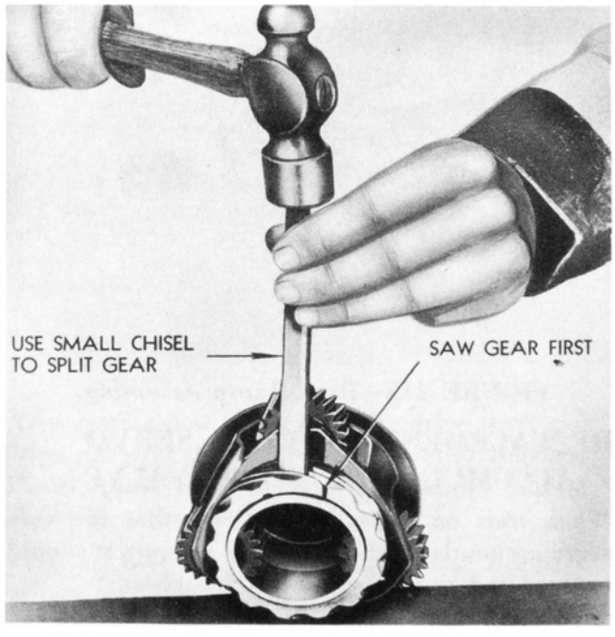


FIGURE 221—*Removing Oil Pump and Governor Drive Gear.*

NOTE: *The face of gear having a forged depression ($\frac{5}{64}$" diameter by $\frac{1}{16}$" deep) goes down toward the shoulder of the planet carrier assembly.*

Using heavy asbestos gloves, pick up gear and drop it quickly over reverse carrier with groove in gear over ball. Push gear all the way down against shoulder.

Install snap ring.

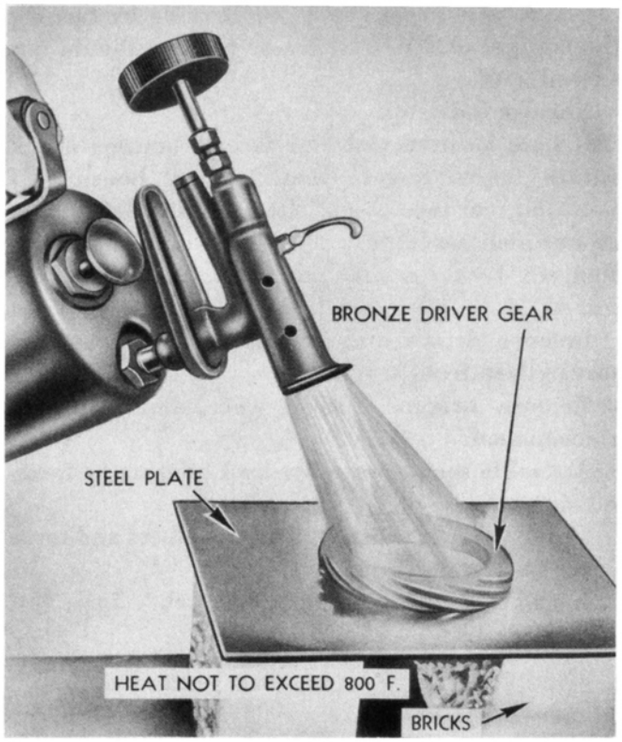


FIGURE 222—*Heating Bronze Drive Gear.*

REPLACEMENT OF THROTTLE VALVE INSIDE LEVER AND SHAFT

When inspection indicates that replacement of the throttle valve inside lever, shaft and shaft oil seal are necessary, proceed as follows:

Drive out the throttle valve shaft pin (Fig. 223).

NOTE: *Support the shaft so as not to damage the detent control lever or outer valve body during this operation.*

Replace the throttle valve inside lever and shaft, shaft oil seal, and oil seal metal retaining washer.

Drive in a new shaft pin, observing the note above.

Check the throttle valve inside shaft for freedom of movement.

REPLACEMENT OF FLYWHEEL HOUSING

Service Flywheel Housing Assembly

Front and rear flywheel housings for service are finish machined while assembled on a master cylinder block. Therefore, they are not available separately. The rear housing includes dowels which enter holes in the front housing.

Installation of Service Flywheel Housing Assembly

Remove transmission assembly.

Remove flywheel to crankshaft dowel and flywheel.

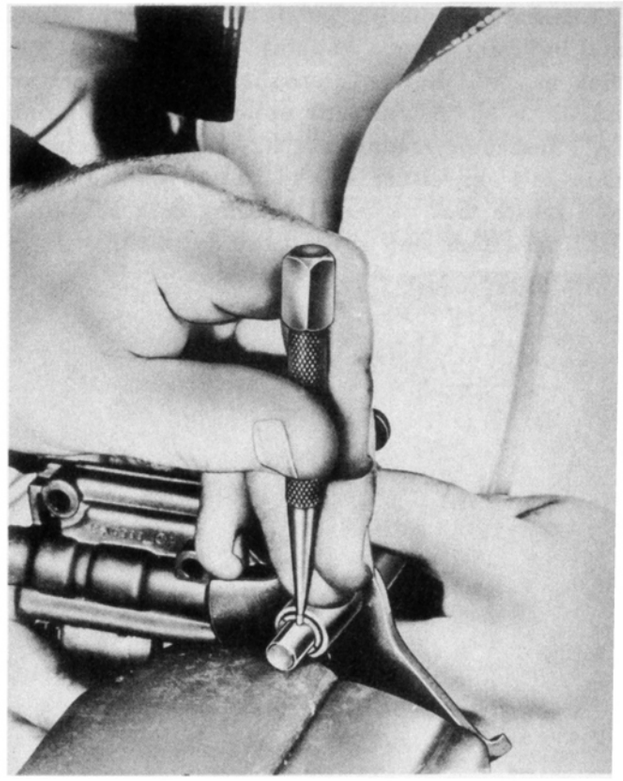


FIGURE 223—*Driving Out Throttle Valve Shaft Pin.*

Remove front flywheel housing from engine.

Install service flywheel housing assembly or engine to permit checking alignment.

Mount dial indicator on crankshaft flange so spindle on indicator contacts inside of four-inch hole in rear housing (Fig. 224).

Check location of hole in rear flywheel housing as follows:

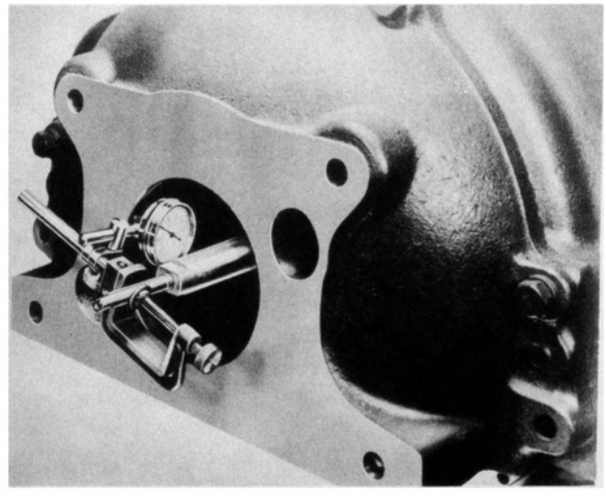


FIGURE 224—*Dial Indicator in Place to Check Hole.*

Check horizontally: Rotate crankshaft to place dial indicator spindle at point "A", (Fig. 225). Set dial at "0". Rotate crankshaft until indicator spindle is at "B", directly opposite starting point "A". Indicator reading at "B" must not be more than .004" on either side of initial reading. This will insure that center of housing hole is within .002" on either side of center of flywheel.

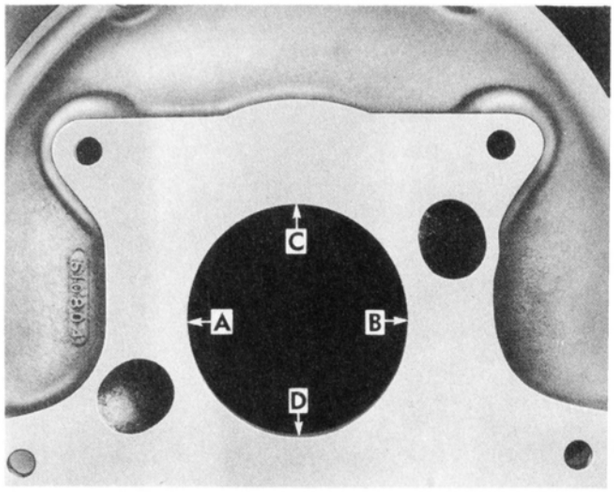


FIGURE 225—*Checks for Location of Hole in Rear Flywheel Housing.*

Check Vertically: Rotate crankshaft to place dial indicator spindle at point "C", (Fig. 225). Set dial at .010". Rotate crankshaft until indicator spindle is at "D" directly under "C". Indicator reading must be between .006" and .000" (.004" preferred). This will insure that center of hole in housing is between .002" and .005" below center of flywheel.

Change indicator location so stem contacts rear face of flywheel housing 3/8" from the edge of the hole (Fig. 226).

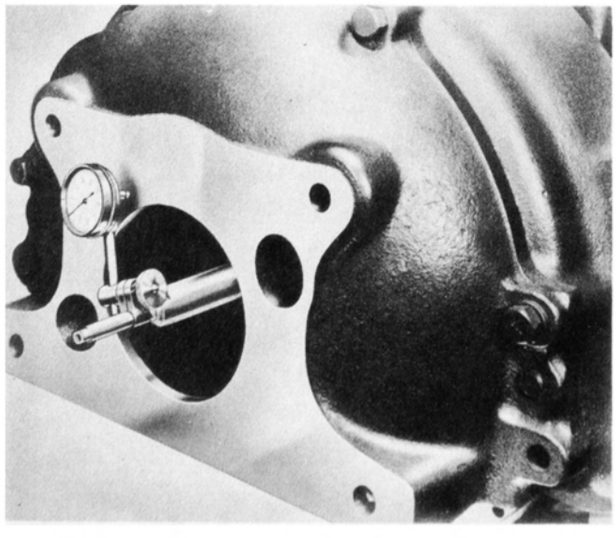


FIGURE 226—*Dial Indicator in Place to Check Face.*

Check squareness of face of housing by turning the crankshaft. Total indicator reading should not exceed .003".

Remove indicator.

If hole location and rear face of housing check within limits, remove rear flywheel housing. If hole and rear face do not check within limits align as outlined under Flywheel Housing Alignment. Remove rear housing when alignment is completed.

Remove driven and drive torus members and torus cover from transmission.

Remove original rear flywheel housing from transmission.

Assemble service rear flywheel housing to transmission.

Install drive and driven torus members and torus cover on transmission.

Install flywheel and oversize dowel.

Replace transmission assembly.

NOTE: *Be sure to use lock washers under heads of front to rear flywheel housing bolts.*

FLYWHEEL HOUSING ALIGNMENT

Rear flywheel housings found to be misaligned during the inspection operation can be aligned in the following order.

Install shims between the front housing and engine block to bring the indicator reading on the face of the housing within limits. Arrange the shims that they can be installed over the dowel bolts or the upper bolt holes.

A shim may be installed at points "A" and "B" to change the top to bottom indicator reading. Shims installed at points "A" and "C", or "B" and "D", will change the side indicator reading. Shims installed at points "C" and "D" change the bottom to top indicator reading.

Aligning Procedure

Remove front and rear flywheel housing assembly.

Locate shims as required holding them in position with petrolatum.

Install front and rear flywheel housing assembly.

Recheck face alignment. Total indicator reading on a 4¾" diameter should not exceed .003" (Fig. 226). Relocate shims if necessary to bring reading within limits.

Relocate rear flywheel housing to position hole if necessary.

Special oversize flywheel housing dowels are available to permit shifting of the housings to position the transmission pilot hole.

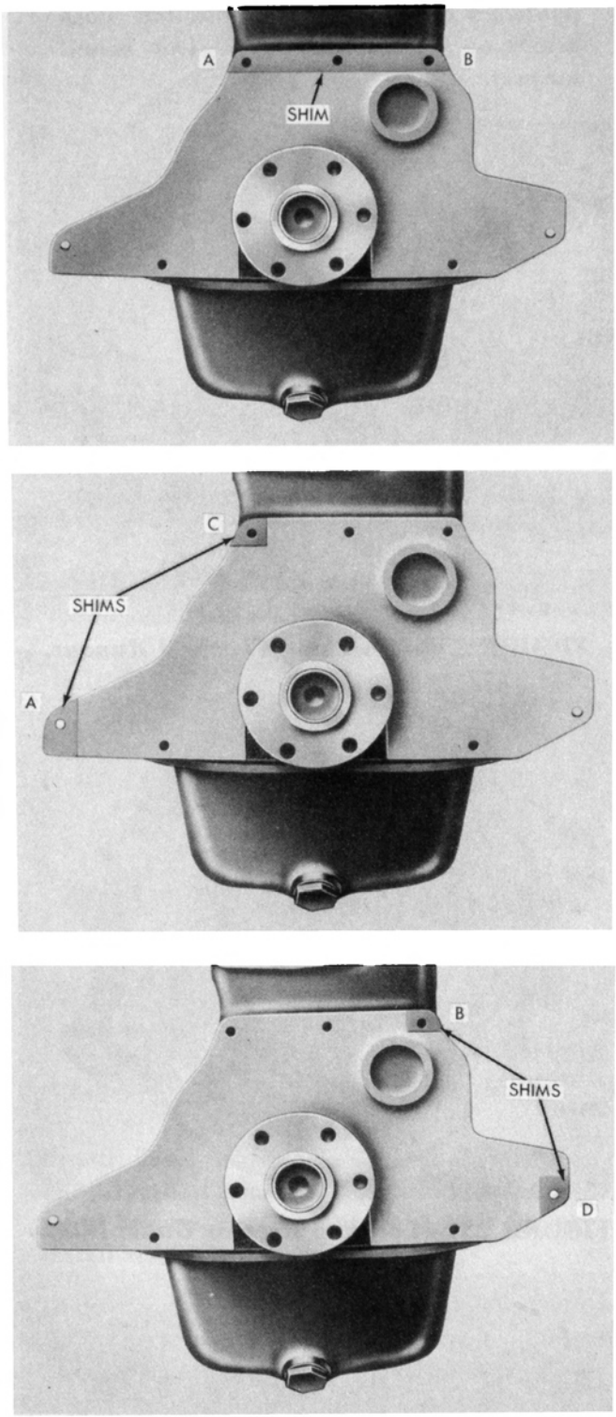


FIGURE 227—*Shim Locations.*

Relocating Procedure

Separate housings; remove dowel pins from rear housing and replace the housing.

Install dial indicator and shift rear housing until indicator reads within limits illustrated in Figure 224.

Tighten housing attaching bolts and nuts and recheck alignment.

Using special reamer, ream dowel holes for oversize dowels.

Install oversize dowel.

REPLACEMENT OF FLYWHEEL

Flywheel to Crankshaft Construction

The flywheel is held with six ½" special bolts which are tightened gradually to 105 foot pounds torque, using alternate opposites.

A dowel pin is used to carry part of the torque. This dowel pin is a press fit in both the flywheel and crankshaft (Fig. 228).

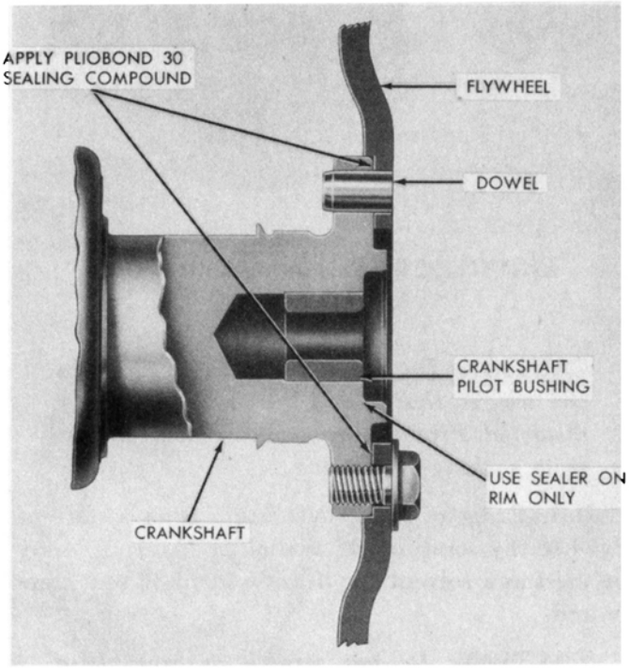


FIGURE 228—*Flywheel to Crankshaft Construction.*

When making repairs, the dowel hole is finish reamed and an oversize dowel is installed after the six flywheel to crankshaft bolts are tightened. Dowels cannot be reused after removal, nor can another dowel be used in the same dowel hole. This procedure removes scores and prevents oil leakage. Special tools are available for this procedure.

Oil Leak at Flywheel Seal, Dowel or Bolts

When inspection shows an oil leak to be located at the flywheel to crankshaft seal, dowel, or at one or more of the flywheel to crankshaft bolts (refer to Trouble Diagnosis and Testing), it will be necessary to remove the flywheel and make the following repairs:

Remove transmission assembly.

Remove flywheel to crankshaft dowel using tool J-2774-1 and J-2153 (Fig. 229). Dowel must be tapped (5/16"–24) for tool J-2774-1.

Remove flywheel bolts, plates, and flywheel. If flywheel does not come off easily, a slight prying action between front surface of flywheel and block may be necessary.

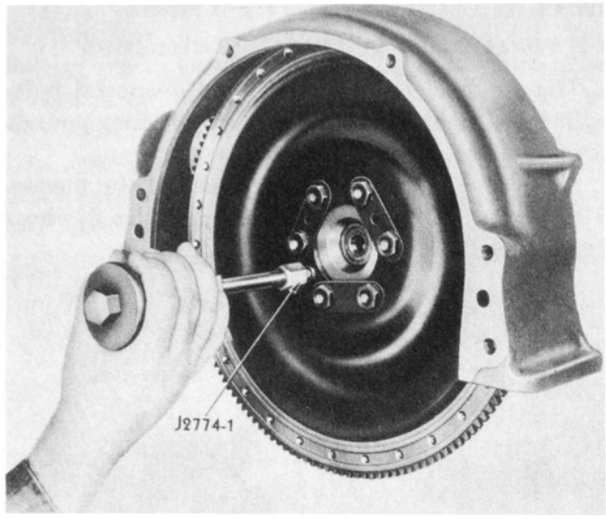


FIGURE 229—*Removing Dowel with Special Tools.*

CAUTION: *Do not hammer on flywheel in any way so that it will become damaged or distorted. Protect torus cover gasket surface from nicking or burring.*

Clean flange of crankshaft and mating surface of flywheel by scraping. If available, "Acetone" may be used as a solvent for the Pliobond 30 seal compound.

CAUTION: *Do not scratch or nick these surfaces.*

Apply a thin film (approximately ½" wide) of special seal compound (Pliobond 30) on the surface of crankshaft at bolt circle diameter. Smooth seal compound around toward outer edge and allow to dry (approximately one minute).

Install flywheel on crankshaft flange carefully and enter all flywheel bolts through plates. Replace bolts and hardened plates. Tighten bolts diametrically opposite in uniform manner to 105 foot pounds torque.

NOTE: *Care exercised to draw the flywheel on evenly during this operation will prevent leakage and excessive runout.*

Mount dial indicator so stem or button rests on torus cover gasket seal area and check flywheel runout. Runout should not exceed .005" total indicator reading (Fig. 230).

Ream dowel hole for oversize (service) dowel using tools J-2774-12, J-2774-14, J-2774-15, J-2774-16, and J-2774-17.

CAUTION: *The bolts used for holding the Guide Block, tool J-2774-12, to flywheel are not heat treated alloy steel and should be tightened only enough to hold the block firmly to flywheel (45 to 50 foot pounds torque).*

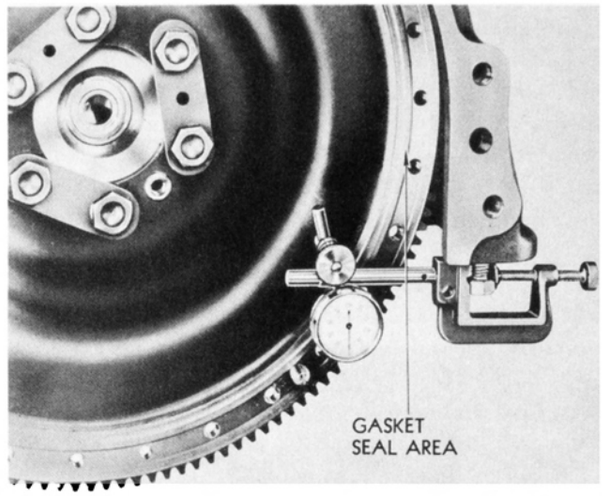


FIGURE 230—*Checking Flywheel Runout.*

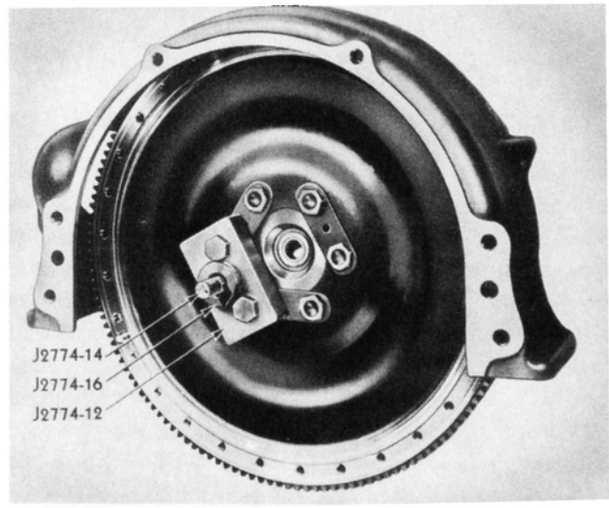


FIGURE 231—*Locating Reamer Guide Block.*

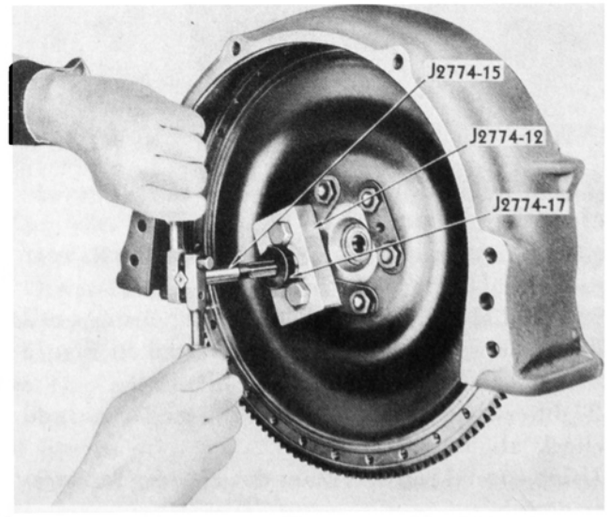


FIGURE 232—*Reaming For Oversize Dowel.*

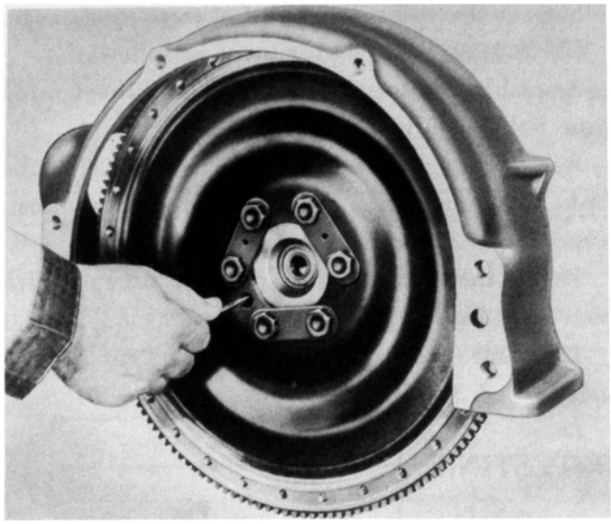


FIGURE 233—*Removing Sharp Edge of Hole with Scraper.*

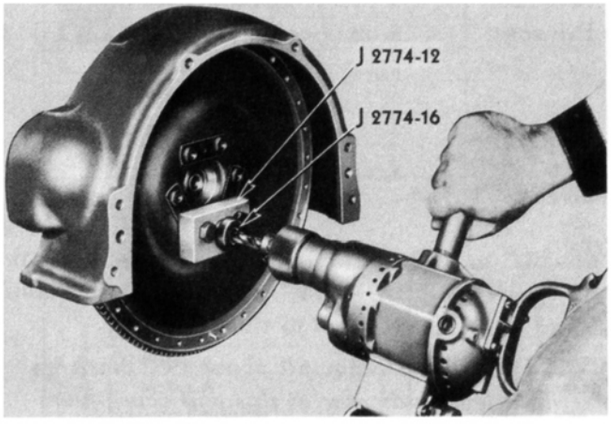


FIGURE 234—*Drilling Out Crankshaft Dowel Hole.*

Install dowel using tool J-2774-13 (Fig. 235). CAUTION: *Front end of dowel must not extend beyond front face of crankshaft flange.* Install transmission assembly.

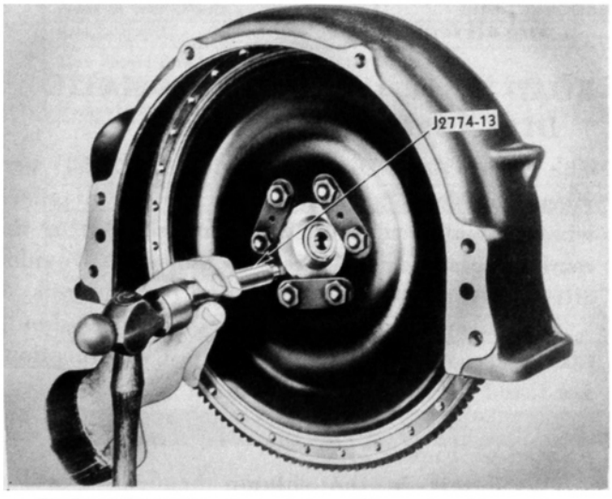


FIGURE 235—*Installing Oversize Dowel.*

Installation of Service Crankshaft or Engine

The dowel hole in the service crankshaft and service engine is $^{15}/_{32}$″ in diameter. When installing either of these parts, enlarge the dowel hole using a sharp ½″ drill and tools J-2774-12, J-2774-14, and J-2774-16, before reaming for the oversize dowel (Fig. 232).

To do this, follow procedure outlined in Replacement of Flywheel.

INSPECTION OF DRIVEN TORUS CHECK VALVE

Inspect the face of check valve (bearing surface) for scores.

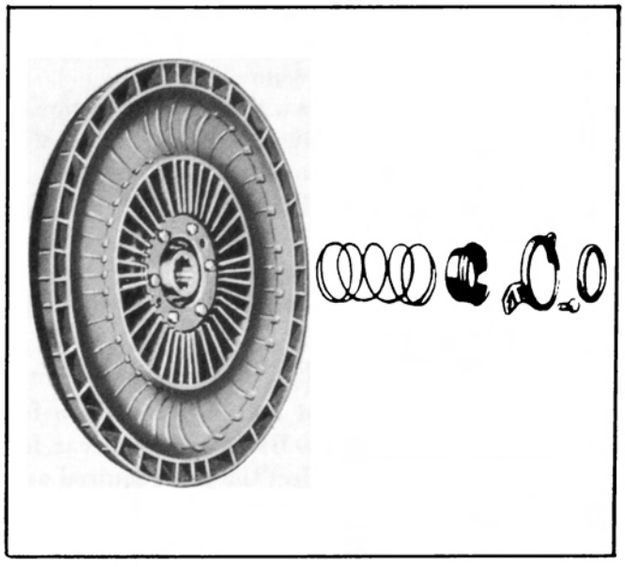


FIGURE 236—*Torus Check Valve Exploded View.*

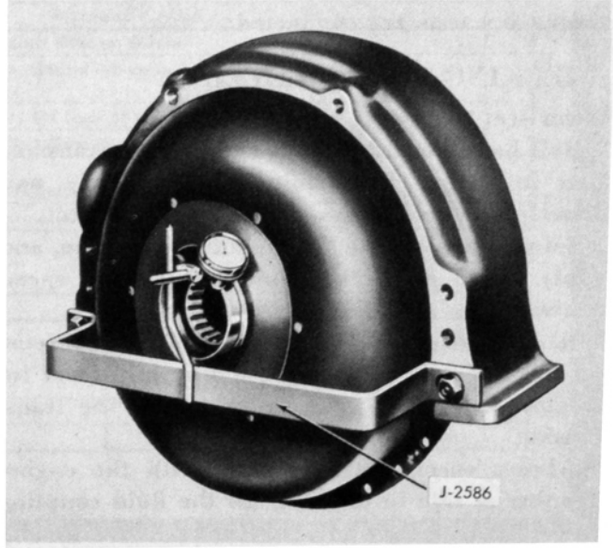


FIGURE 237—*Checking Torus Cover Runout, Tool and Indicator Can Be Mounted for Reading Underneath Car if Desired.*

Inspect the inside bearing diameter of valve for scores.

Check movement of valve over hub of driven torus member. Free length of spring $3\frac{17}{32}$".

Clean all parts thoroughly. Make a list of those to be replaced.

INSPECTION OF TORUS COVER

Inspect inner and outer diameter of torus cover oil seal hub for score marks.

Inspect grooved gasket surface for nicks or burrs. Two continuous ridges should appear on the sealing surface.

Inspect the splines of hub for wear or damage.

Check torus cover hub runout as follows:

Assemble the torus cover to the flywheel using four bolts evenly spaced.

Assemble a dial indicator to tool J-2586 so the hole attachment contacts the hub of the torus cover (Fig. 237).

Rotate the engine and observe the runout which must not exceed .005".

If runout exceeds .005" and flywheel runout does not exceed .005", replace torus cover.

DIAGNOSIS AND TESTING

Subject	Page
Checking Fluid Level	80
Road Test Using Hydra-Matic Diagnosis Guide	80
"Stall" or Torque Test	84
Possible Difficulties and Corrections	85
Locating Hydra-Matic Difficulties With Air Pressure	87
Testing "Main Line" Oil Pressure	88
Testing For Fluid Leaks	89
Testing For Noises	92
Test for Broken Rear Servo Check Valve	94
Test for Missing or Sticking Torus Check Valve	94

DIAGNOSIS AND TESTING

The procedures contained in this section are for use when testing a Hydra-Matic equipped car for standard performance. Select the test required and perform it in the manner recommended. This will lead to an accurate diagnosis of the trouble and minimize the need for a complete disassembly of the transmission. Transmission fluid level must be checked and Hydra-Matic fluid added, if required, before any tests are conducted.

CHECKING FLUID LEVEL

Cover seat to protect upholstery.

Roll back front floor mat and remove transmission inspection floor hole cover in floor pan directly over transmission fluid lever indicator.

Set selector lever in "N" (neutral) position, and apply the hand brake. Run engine at a speed equivalent to 20 MPH for several minutes.

Reduce the engine speed to slow idle (carburetor off the fast idle step) remove the fluid level indicator, wipe clean, and reinsert it in the transmission.

Always check the fluid level with the engine running at idle in order to fill the fluid coupling and obtain an accurate reading. Remove the indicator and note reading. The two lines on the indicator are marked "F" (full) and "L" (low). It requires $1\frac{1}{2}$ to 2 pints to raise the level from the "L" to "F" mark. If the fluid level is at the "L" mark add "AQ-ATF" approved Hydra-Matic Fluid to bring the level to the "F" mark.

CAUTION: *Do not fill above "F" mark on fluid level indicator as this will cause foaming when transmission is warm.*

Stop the engine. Replace the fluid level indicator and floor hole cover. Return floor mat to its original position and remove seat cover.

NOTE: *If the fluid level is low when checked, and there are indications of fluid leakage, correction should be made to eliminate all leaks.*

ROAD TEST USING HYDRA-MATIC DIAGNOSIS GUIDE

The Hydra-Matic Diagnosis Guide (Fig. 238) provides a uniform and systematic trouble diagnosis which is both accurate and thorough. During the road test place a check mark in the space provided after the various conditions when encountered.

The normal speeds at which the shifts should take place and Stall or Torque test specifications are listed on the Diagnosis Guide (Fig. 239).

Instructions for using the Diagnosis Guide are printed on Figure 240.

The letters in the column headed "Possible Causes" refer to the units listed in the "Legend."

HYDRA-MATIC DIAGNOSIS GUIDE

FOR NASH CARS

COVERING

1. Shifting 2. Noise 3. Oil Leaks

IMPORTANT—BEFORE TESTING, ALWAYS——1. CHECK OIL LEVEL——2. CHECK ENGINE IDLE

Date_____ Trans. No._____

Owner_____ R. O. No._____

Mileage_____ Tester_____

SHIFT CONDITIONS

SHIFT CONDITIONS	√	Possible Causes	OTHER CONDITIONS	√	Possible Causes
Too High		C-G-H	Excessive Creeping		B-O-P
Too Low		C-G-H	Slipping		A-C-D-E-F-G-I J-M-O-P-R-U-V
Varies		C-F-G-H	Jumps out of Reverse		C-N
Hunting		C-G	No Drive Forward		A-C-D-F-E-I-M-K
Misses one or more shifts		G-H-O	Locks up on reverse coast		D-F-G-J-K
Improper Throttle downshift		C-D-G-H-K	Moves forward when in reverse		P
Engine speeds up, Band apply rough		C-F	Noisy		See Noise Section
Rough downshift to 1st		G-J	Ratching Noise when shifted to reverse		B-C-D-G-J-N
Violent Shifting		C-G	No drive in reverse		E-N
Shifts above 2nd in low range		G-H	Drives in reverse only		C-N-T
No shifts—Stays in same gear		C-G-H			

ALWAYS CHECK CAUSES IN SEQUENCE GIVEN

LEGEND

A	Oil Level	I	Front Servo	R	Oil Delivery Sleeve
B	Engine Idle Speed	J	Rear Servo	S	
C	Linkage	K	Front Oil Pump	T	Manual Detent Lever
D	Oil Pressure	L	Rear Oil Pump	U	Restriction in Oil Circuit
E	Servo Bands	M	Fluid Coupling	V	Excessive Oil Leak in Circuit
F	Pressure Regulator	N	Reverse Unit	W	
G	Control Valve Assembly	O	Front Unit	X	
H	Governor	P	Rear Unit	Y	

OIL LEAKS

WHERE NOTICED	POSSIBLE CAUSE	√
Between Flywheel & Crankshaft Flange	Loose Flywheel to Crankshaft Bolts or Gasket	
Fluid Coupling & Flywheel or Fluid Coupling Proper	Flywheel to Torus Cover Gasket—Flywheel Sealing Area, Drain plug or Dampener Rivets	
Front of Transmission	Front Cover, Gasket, Front Oil Seal or Oil Seal Rings	
Bottom Oil Pan	Oil Pan Gasket—Drain Plug Gasket	
Side Cover Pan—or left rear corner of transmission	Side Cover Pan Gasket—Throttle and Manual Shaft seals, Pressure line plug	
Rear of Transmission	Rear Oil Seal—Rear Bearing Retainer Gasket	

NOISE

OCCURS UNDER FOLLOWING CONDITIONS	POSSIBLE CAUSE	√
Neutral, 1st and 2nd Gears only	Rear Unit Planetary Gears	
Neutral, 1st, 3rd and Reverse Gears only	Front Unit Planetary Gears	
Reverse Gear, Acceleration only	Reverse Unit Planetary Gears	
Reverse Gear, Deceleration only	Rear Unit Planetary Gears	
Metallic scraping at front of transmission	Excessive Backlash—Torus Members	

FIGURE 238—*Hydra-Matic Diagnosis Guide—Front.*

HYDRA-MATIC SHIFT POINTS IN M. P. H.

"AMBASSADOR"

UPSHIFTS

	DRIVE RANGE		L RANGE	
SHIFT	MINIMUM THROTTLE	FULL THROTTLE	MINIMUM THROTTLE	FULL THROTTLE
1-2	6-9	17-21		17-21
2-3	10-14	31-37		
3-4	19-24	62-69		

DOWNSHIFTS

	DRIVE RANGE			L RANGE		
SHIFT	CLOSED THROTTLE	FULL THROTTLE	FORCED	CLOSED THROTTLE	FULL THROTTLE	LOCKOUT
4-3	16-12	21-16	62-16			
3-2	11-7	10-6	20-16			
2-1	7-4	10-6			11-7	
4-2						48-39

"STATESMAN"

UPSHIFTS

	DRIVE RANGE		L RANGE	
SHIFT	MINIMUM THROTTLE	FULL THROTTLE	MINIMUM THROTTLE	FULL THROTTLE
1-2	5-9	13-17		13-17
2-3	9-13	27-32		
3-4	18-22	55-61		

DOWNSHIFTS

	DRIVE RANGE			L RANGE		
SHIFT	CLOSED THROTTLE	FULL THROTTLE	FORCED	CLOSED THROTTLE	FULL THROTTLE	LOCKOUT
4-3	15-12	19-13	55-15			
3-2	10-7	9-5	19-15			
2-1	7-5	9-5			9-6	
4-2						48-39

STALL TEST

TEST CONDITIONS	ENG. R. P. M.	ENG. R. P. M.	ENG. R. P. M.
"AMBASSADOR" "STATESMAN"	1750 TO 1950 1600 TO 1800	UNDER 1750 UNDER 1600	OVER 1950 OVER 1800
With the engine at operating temperature, set control lever in D position. Fully apply hand and foot brake, and accelerate engine to wide open throttle.	NORMAL	Poor engine performance such as need of tune up, etc.	Transmission slippage or excessive torus coupling slippage. (Do not hold throttle open.)

FIGURE 239—*Hydra-Matic Diagnosis Guide.*

INSTRUCTIONS

for Using the

HYDRA-MATIC DIAGNOSIS GUIDE

1. Before testing the car with this guide, check the transmission fluid for proper level, with engine running and its slow idle speed set at 375 R.P.M. (with gearshift control lever in "N" position). Either of these items will cause many different irregularities in transmission operation.

2. While driving the car, be on the alert for any indication of any improper engine performance. If any, correct them before making final diagnosis.

3. The shift points shown on this guide are average and may vary slightly. One or two miles per hour either way is no cause for adjustment as long as the shifts are smooth.

4. The causes for these irregular operating conditions are necessarily general, pointing to the major assemblies. This permits the use of a concise one-page diagnosis form.

5. The various causes of any particular condition are listed in order of the trouble. Over one-fourth of these can be remedied by *external* adjustments, and over three-fourths can be repaired with the transmission *in the car.* Never order the transmission removed from the car until the "on car" repairs have been completed, or until visual inspection of the transmission after removal of the oil pan and side cover (oil sediment, excessive backlash, burned drums, etc.) definitely indicates the need for complete disassembly. *ALWAYS CHECK THE CAUSES IN THE SEQUENCE LISTED.*

6. The only exception to step 5 occurs when two or more conditions have one common cause; then fix that particular item first.

7. When checking linkage, always inspect rods and relay levers for wear as well as for proper adjustment, because worn linkage will never hold proper adjustment.

8. When checking for slippage, always use the "stall test" on the back of this guide.

9. Obviously, the value of this diagnosis guide will be lost unless it is used properly. After the sheet has been filled out during the road test, the proper corrective measures for the repair order will be apparent. The sheet should then be attached to the shop copy of the repair order and remain with it throughout the shop, finally, accompanying it into the car records. This will enable the mechanic to know what specific condition his work is to correct and will provide definite information for future reference.

FIGURE 240—*Instructions for Using the Diagnosis Guide.*

FOLLOW THE INSTRUCTIONS OUTLINED AND PERFORM A COMPLETE DIAGNOSIS

Remember

75% OF ALL TROUBLES CAN BE CORRECTED BY EXTERNAL ADJUSTMENTS AND OIL LEVEL—OVER 85% OF REMAINDER OF TROUBLES CAN BE CORRECTED WITH THE TRANSMISSION IN THE CAR.

Test Route

A predetermined test route should be established to save time and permit comparison of different cars over the same route. Where possible, the route should be laid out to include a hilly section to test for open throttle upshift, slippage and throttle downshifts, a level section for testing for noise. When a chassis dynamometer is available, it may be used as a substitute for the road test.

"STALL" OR TORQUE TEST

A "Stall" or Torque test may be made to determine engine and transmission performance. This test must be used with moderation because considerable strain is exerted on the drive line, differential gears and axles. To perform "Stall Test," proceed as follows:

Start engine and warm up to operating temperature.

Connect electric tachometer.

Set hand brake lever tightly and apply foot brake firmly.

Place selector lever in "D" position.

Depress accelerator pedal to floor.

Action here has placed transmission in first speed. Brakes are applied, therefore, the car cannot move. Opening the throttle and speeding up the engine is comparable to slipping a mechanical clutch, as the driving torus is turning and trying to turn the driven torus which is held stationary by the transmission being in first speed and brakes locked.

The engine will speed up until the friction created between the torus members equals the power output of the engine. Engine speed will denote engine efficiency and should compare to specifications outlined in the diagnosis guide.

If engine RPM is less than the low limit, the engine is in need of a tune-up.

NOTE: *If transmission front unit is tied up, low engine RPM will result.*

If engine continues to speed up to approximately 350 RPM above the high limit, it indicates that bands are not holding properly or that there is slippage in fluid coupling due to missing check valve, damaged torus members, or defective front pump cover oil seal ring.

CAUTION: *Extreme care must be used in making this test. NEVER HOLD THROTTLE OPEN MORE THAN ONE MINUTE. If engine speeds up to 350 RPM over specifications, close throttle immediately to avoid possible damage to transmission.*

Sometimes it is desirable to know which band is slipping. After making test with selector lever in "D" position, place lever in "R" position and test again. If slippage still occurs, fault is with front band or both. If slipping does not occur, then all slippage is in the rear band.

Check Cause for Slipping Under "Stall Test"

Set hand brake lever tightly.

Start engine and run at a speed equivalent to 20 MPH for approximately 1½ minutes. Then, with engine IDLING, selector lever in "D" range, check the fluid level in the transmission.

See that fluid is at the "Full" mark on the indicator.

After level has been checked, shut off engine and wait 10 minutes. Re-check fluid level with engine shut off. If after 10 minutes, the fluid level in the transmission has not raised more than ½ inch, the driven torus check valve is operating satisfactorily.

If check valve is operating satisfactorily, adjust bands and test car using Diagnosis Guide.

HYDRA-MATIC TRANSMISSION SECTION

POSSIBLE DIFFICULTIES AND CORRECTIONS

CONDITION	PROBABLE CAUSE	CORRECTION
Selector Lever stuck in Reverse position	Damaged parking brake pawl crank	Replace parking brake bracket assembly
	Rough detent plunger	Free up
Selector Lever will not go in Reverse	Governor G-1 valve sticking open	Clean Governor assembly
	Reverse blocker piston sticking in bore of parking brake bracket assembly	Free up
Slipping 2-3 and 4-3	4-3 downshift valve sticking in front servo or by omission or incomplete installation of 4-3 valve retainer	Make certain valve is drilled correctly and is free. Install retainer correctly
	Overrun control valve in front servo sticking	Free up
No drive in reverse (slipping)	Pressure regulator reverse oil pipe missing	Install pipe
	Reverse clutch pipe missing	Install pipe
	Reverse booster plug missing from pressure regulator	Install new pressure regulator assembly
	Low line pressure	Check for leak in circuit and possible low pump output
	Hole in case to pressure regulator not drilled through	Drill hole or replace case
No drive in reverse (lock-up) when shifting from D to L to R	Foreign matter in outer valve body blocking .062" hole supplying oil for rear servo release	Clean outer valve body
	.062" hole not drilled	Drill .062" hole
No parking pawl engagement when engine is shut off with transmission in reverse	Parking pawl binding on anchor bolt or against case	Free up
	Damaged parking brake pawl crank or interference which does not allow crank to throw over center	Replace parking brake bracket assembly

POSSIBLE DIFFICULTIES AND CORRECTIONS (Continued)

CONDITION	PROBABLE CAUSE	CORRECTION
	Binding parking blocker piston	Free up
No drive	Lack of pump pressure due to:	
	Broken Pump Rotor	Replace pump
	Stuck line exhaust valve	Free up or replace line exhaust valve and/or case
	Plugged line exhaust valve hole	Remove foreign matter
	Lub. line in front pump not drilled through	Replace front pump
	Front pump slide stuck	Replace front pump
No reverse engagement	Blocker piston stuck	Free up blocker piston
	Governor stuck	Clean governor
High line pressure	Front pump slide stuck	Replace front pump
	Pressure regulator gasket installed backwards damaging gasket	Replace gasket
	Wrong pressure regulator spring	Replace pressure regulator spring
Constant and loud flutter in pressure regulator plug	Front servo oil hole plug missing	Replace missing plug
	Front pump suction pipe loose or out of position or damaged seal	Reinstall pipe or replace damaged seal
Erratic shifts	Front servo oil hole plug missing	Replace missing plug
	Former governor feed line hole plug in governor oil delivery sleeve missing	Replace missing plug
	Oil leak between parking bracket and transmission case	Tighten bolts or replace bracket

LOCATING HYDRA-MATIC DIFFICULTIES WITH AIR PRESSURE

Time can be saved in determining the cause of difficulty with all guess work eliminated by using the air pressure method described herein before the Hydra-Matic transmission is disassembled.

After a transmission overhaul, this method can also be used to make sure the unit is operating properly prior to reinstallation.

The test can be made on the car by removing the following parts:

Bottom oil pan and screen.

Side cover.

Control valve assembly.

Reverse clutch oil pipe.

Apply approximately 80 pound air pressure, with an air hose nozzle that will fit into the oil holes, and check each passage and unit for possible leakage in the following sequence (Fig. 241).

Air pressure applied to Item 9, should actuate the front clutch. As pressure is applied intermittently, the movement of the clutch piston should be audible and can be felt with a free hand by holding on to the drum. If an abnormal amount of air escapes around the oil delivery sleeve area, another check at this point must be made after the servo is removed to observe more clearly the exact point of leakage; look for a broken or damaged oil delivery sleeve ring. If a mist of oil is noted from the inside of the front unit drum assembly, accompanied by the escape of a large amount of air, it is probably due to a faulty front clutch annular piston seal. If leakage is noted from other drilled passages in the side of the case, while pressure is applied, this indicates a faulty transmission case or oil delivery sleeve allowing pressure to by-pass between passages.

Air pressure applied to passage (6) should activate the front servo and apply the band with no unusual escape of air. There should be no leakage of air at the area around the flat surface of the servo body that rests on the case. A slight leak from the oil hole (11) and the 4 to 3 valve exhaust hole is permissible. However, a leak from hole (11) should not be an open blow-by, but only the amount that would leak past the servo apply piston ring gap.

Applying pressure at passage (11) will not actuate the servo because the apply piston is held in the release position by the retracting spring. There should be no unusual escape of air between the servo body and transmission case or from any other passage on the side of the case except possibly a small amount from passage (6).

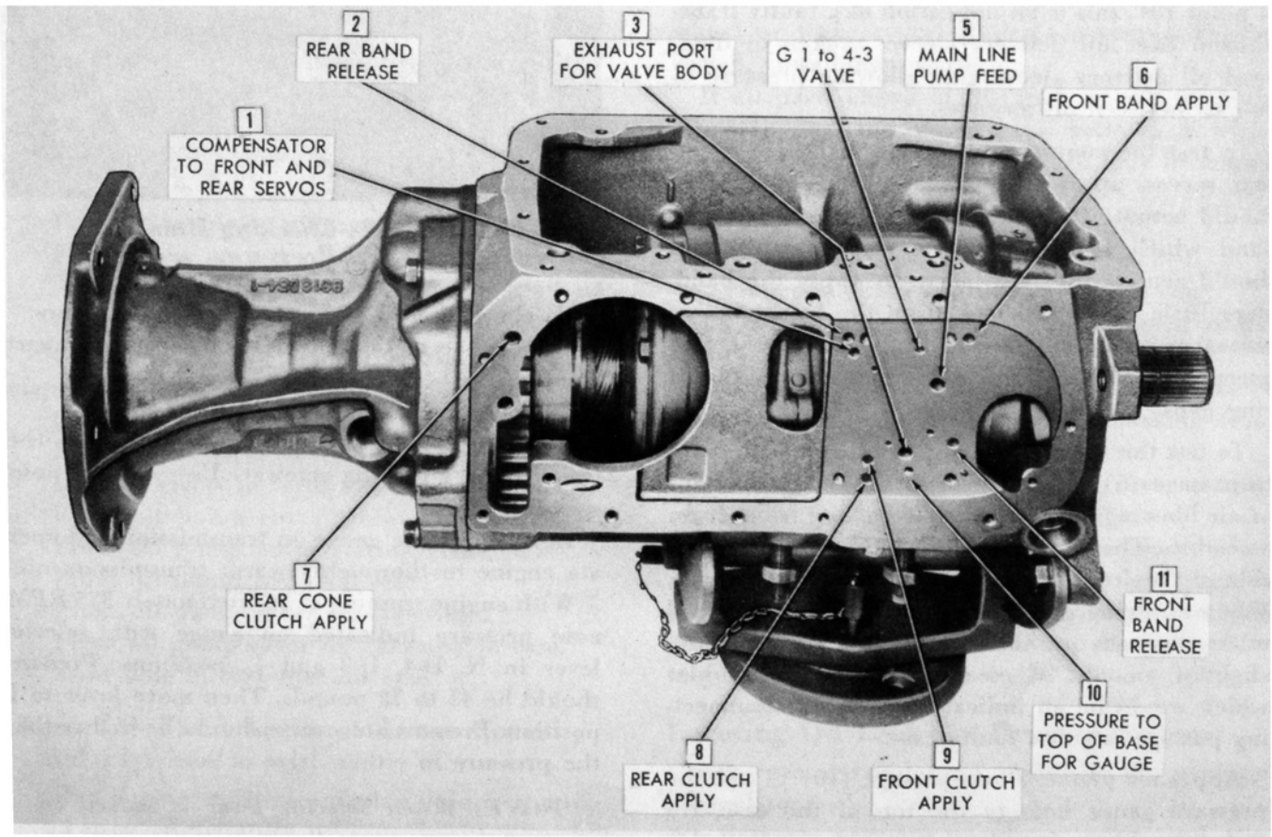


FIGURE 241—*Location of Oil Hole Passages.*

To test the governor, apply air pressure into passage (4). A leak around the 4 to 3 valve wire retainer is normal. No air should escape between the servo body and transmission case or from any other passage on the side of the case except possibly a small amount from passage (6).

Air pressure applied to passage (2) should release the rear band. A small amount of air will escape between the piston ring gap, but this would not indicate enough leakage to affect normal servo operation. No great amount of air should escape between the servo body and case. A small leak at passage (1) is normal, but there should be no leakage from any other passage.

Air pressure applied into passage (8) should actuate the rear clutch. If pressure is applied intermittently, movement of the clutch piston should be audible and can be felt with a free hand holding on to the drum. If a large amount of air escapes around the oil delivery sleeve area, another check must be made at this point after the servos are removed to observe more clearly the exact point of leakage. If a mist of oil is noted from the inside of the rear drum unit, accompanied by an escape of a large amount of air, it is probably due to a faulty rear clutch annular piston seal. If any leakage is noted from other drilled passages inside of the transmission case, while pressure is applied at point (8), this is an indication of a faulty transmission case, oil delivery sleeve, broken or damaged oil delivery sleeve ring allowing pressure to by-pass between oil passages.

To test the compensator between the front and rear servos, apply pressure at passage (1). This should actuate the rear servo to tighten the rear band which is applied by spring pressure and should actuate the front servo to apply the band. Very little air should leak from the front or rear servos, or any other passage on the side of the case except that which might escape between the piston ring gaps.

To test the main line pump feed, apply pressure to passage (5). This will result in a large amount of air blowing out from the side of the front drum assembly. This blow-by is emitted from the rear side of the front pump and is considered normal. When applying pressure at point (5), observe all other passages on the side of the case for the slightest amount of escaping air or oil bubbles which would be an indication of an interconnecting passage due to a faulty case.

Apply air pressure into passage (10) to test the pressure gauge hole to the top of the case. No leaks should occur. Should any air escape, this would indicate faulty connecting passages.

A complete blow-by to the inside of the case should occur while applying air pressure to the exhaust port for the valve body hole (3). Any obstruction in this passage will cause poor shifting conditions.

Apply air pressure to passage (7) to test the reverse cone clutch. This should actuate the reverse cone clutch with no unusual escape of air. By applying pressure intermittently, movement of the reverse internal gear can be felt as the cone clutch is applied and released.

TESTING "MAIN LINE" OIL PRESSURE

Use Pressure Checking Gauge J-2540 when checking oil pressure in the Hydra-Matic transmission.

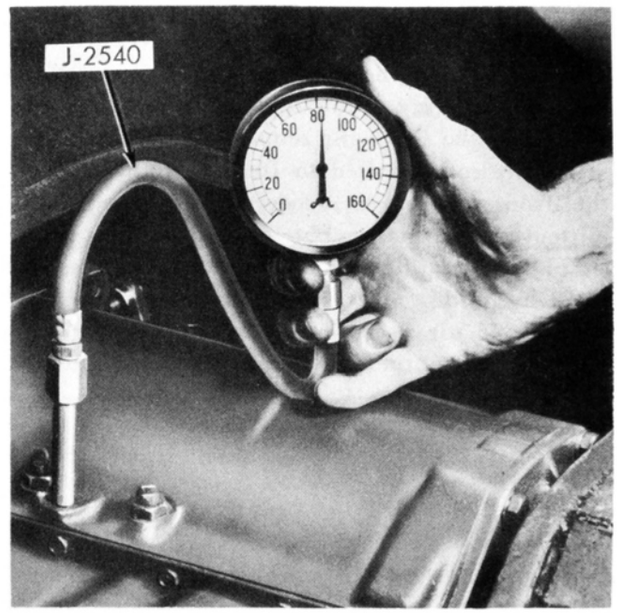


FIGURE 242—*Checking Main Line Oil Pressure.*

To check the oil pressure proceed as follows:

Remove accelerator pedal and front compartment mat.

Remove floor hole and adjusting cover.

Remove pipe plug from transmission case (between band adjusting screws). Use $\frac{7}{16}$" six point socket.

Install pressure gauge on transmission and operate engine to thoroughly warm transmission oil.

With engine running at approximately 375 RPM, note pressure indicated on gauge with selector lever in N, D-4, D-3 and L positions. Pressure should be 45 to 72 pounds. Then move lever to R position. Pressure in reverse should be higher than the pressure in either drive or low.

NOTE: *When selector lever is moved to reverse, pressure will momentarily drop before the higher pressure reading.*

If pressure checked satisfactorily, place selector lever in reverse position and apply foot brake. Accelerate engine to approximately half throttle. Pressure should increase to at least 125 pounds.

Perform Zero Throttle Pressure Test by Road Test

Depress accelerator pedal to give a car speed over 30 MPH in 4th speed.

Close throttle and note pressure gauge reading when car speed drops to exactly 30 MPH. Gauge reading should be between 45 to 72 pounds.

Perform Full Throttle Pressure Test by Road Test

With car moving at approximately 25 MPH in fourth speed, depress the accelerator to the detent without going into a 4-3 downshift.

Note pressure gauge reading when car speed reaches exactly 30 MPH. Gauge reading should be between 75 and 105 pounds.

TESTING FOR FLUID LEAKS

Transmission fluid leaks can be divided into two groups, those which can be corrected without removing the transmission and those which require its removal. If a transmission fluid leak is detected, the following locations should be checked.

The First Group Includes:

- Torus cover drain plug.
- Side cover bolts or pressure line pipe plug.
- Side cover at manual shaft seal.
- Oil pan bolts.
- Oil pan drain screw.
- Rear bearing retainer bolts and seal.
- Pressure regulator plug gasket.
- Fluid leaks at any of the above points are easily located and should be corrected no matter how slight they may seem.

Fluid Leaks That Require Removal of the Transmission From the Car Include the Following:

- Crankshaft to flywheel seal, dowel, and bolts.
- Flywheel to torus cover.
- Damper rivets in torus cover.
- Front oil pump cover screws.
- Front oil pump cover casting (sand hole).
- Front oil pump cover oil seal.
- Front oil pump cover oil seal rings.
- Front oil pump cover to transmission case.
- Sand hole in transmission case.

Check for Fluid Leaks at Torus Cover and Flywheel

- Run engine until transmission fluid is at operating temperature.
- Remove flywheel housing bottom cover.
- Wipe fluid from flywheel and torus cover.
- Place a clean piece of paper under flywheel and transmission.
- Start engine and run at approximately 800 RPM for two minutes.
- Stop engine and examine paper for fluid leaks.
- Fluid leaks, if present will be indicated by a fine spray on the paper usually directly in line with the leak.

Locating Fluid Leaks at Torus Cover and Flywheel

If fluid leaks are indicated, examine flywheel and torus cover for fluid. Fluid on the front face of the flywheel indicates a leak at the crankshaft to flywheel seal, dowel, or bolts. Remove transmission, remove flywheel, replace seal, flywheel and dowel as outlined in Repair Section.

NOTE: *Do not confuse an engine oil leak at the rear main bearing with a flywheel fluid leak.*

Fluid on the torus cover may be coming from the front cover oil seal rings, the front cover oil seal or damper rivets.

If there is no fluid on either the flywheel or torus cover, the leak is at torus cover to flywheel.

Tighten all bolts to 30 foot pounds torque and if leak continues, it is due to a broken gasket or insufficient or damaged sealing surface on the flywheel or torus cover. If damage cannot be corrected, install new parts.

If all parts ahead of the front of the transmission are dry and fluid leaks between flywheel housing and transmission, the leak may be caused by—

- Loose pump cover screws.
- Sand hole in pump cover.
- Poor seal between front cover and case.

To correct above cause of leak proceed as follows:

Remove transmission from the car. Remove torus members and rear flywheel housing from transmission.

If a sand hole is present in pump cover casting, replace complete front pump assembly.

The front pump cover should protrude .003"-.015" out of transmission case with pump cover gasket in place. If pump cover protrudes less than .003", add a pump cover gasket to allow the cover to protrude within limits.

Locating Oil Leaks in Reverse System

Check reverse booster oil circuit in the pressure regulator.

- Remove pressure regulator valve and disassemble.

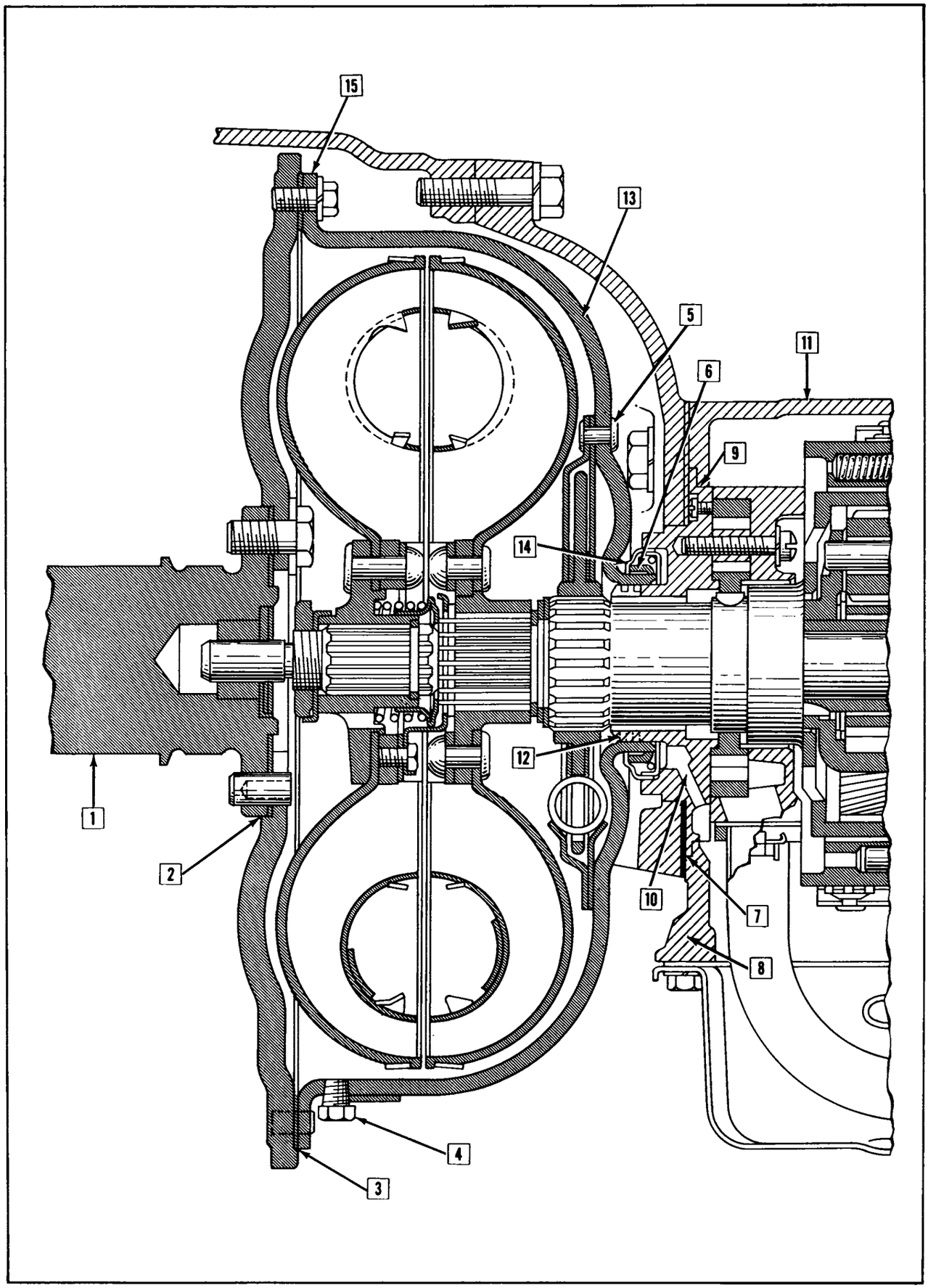


FIGURE 243—*Points to Check For Oil Leaks.*

Possible Location of Front End Oil Leaks	Check For Oil at Points Indicated
Crankshaft rear main bearing oil seal.	Noticeable on front face of flywheel and pan.
Crankshaft to flywheel gasket or sealer, dowel, or bolts.	Noticeable on front face of flywheel.
Damaged torus cover to flywheel gasket.	Oil will be seem on transmission side of flywheel starter gear teeth and inside of bell housing in line with torus cover gasket.
Loose torus cover drain plug.	Oil around plug and inside of bell housing in line with plug.
Loose torus cover damper rivet (very rare).	Oil on torus cover radially from loose rivet and inside bell housing.
Damaged front oil seal.	Oil on torus cover and inside of bell housing in line with front oil seal.
Outer diameter of front oil seal due to poor seal to front pump cover or loose fit in cover.	Oil on torus cover and/or front face of transmission case and inside of bell housing.
Porous or cracked front pump cover. Check with 125 lbs. air pressure (oil pressure check) between band adjusting screws.	Oil on torus cover and/or front face of transmission case and inside of bell housing.
Front pump covering attaching screws not torqued to specifications.	Oil on torus cover and/or front face of tranmission case and inside of bell housing.
Front pump to transmission case due to pump not seating in case caused by insufficient chamfer at pump bore in transmission case, or missing pump to case gasket, damaged gasket, or insufficient protrusion of pump flange from case. Should be .003"-.015". Can be checked by air pressure (125 lbs.) applied to oil filler hole.	Oil on front face of transmission case.
Cracked or porous transmission case—front case.	Oil on front face of transmission case.
Broken oil seal rings in front pump or excessive ring groove wear in torus neck I.D.	Oil on torus cover and inside of bell housing in line with front oil seal.
Pin hole in torus cover (very rare).	Oil on torus cover and inside of bell housing in line with pin hole.
Too much run out at torus cover neck .005 maximum limit.	Oil on torus cover and inside of bell housing in line with front oil seal.
Torus cover to flywheel bolts not torqued to specifications.	Oil will be seen on transmission side of flywheel starter gear teeth and inside of bell housing in line with torus cover gasket.

Inspect reverse booster plug for nicks, scores, and for free movement in regulator plug.

See that the reverse booster is not loose in the bore of the pressure regulator plug allowing excessive oil to escape past it.

Check the oil passages in the pressure regulator with air for obstructions or leaks.

Check pressure plug seal and gasket for damage or wear.

Check connecting passages between control valve assembly and pressure regulator.

Remove side cover and gasket.

Remove pressure regulator reverse oil pipe. Pipe should fit fairly tight into valve body and case.

Inspect pipe to be certain it does not leak.

See that pressure regulator reverse oil passage in case is unobstructed. Also apply air to the pressure regulator reverse oil passage on the outside of the case while blocking the opening in the pressure regulator hole to be certain the passage is not leaking.

Check reverse piston, piston seals and connecting passages to reverse piston. To positively locate a leak in the oil passages to the reverse piston or in the reverse clutch piston or seals proceed as follows:

Remove pressure regulator reverse oil pipe if it has not previously been removed.

Remove four valve body to case attaching bolts.

Slide valve body forward far enough to allow removal of the reverse clutch pipe. Check to see that clutch pipe fits properly in case and valve body does not leak. If clutch pipe is found to be satisfactory apply air pressure at hole in transmission case where clutch pipe was removed. "Air pressure to be 80 pounds minimum." Apply sufficient air to actuate the reverse friction clutch cone to engage the reverse internal gear. When the reverse friction clutch cone has been applied, there will be a slight forward movement of the reverse gear. If the reverse unit is satisfactory, there will be a very slight leakage of air into the transmission case from the reverse unit. Check to determine if the rear bearing retainer to transmission case attaching bolts are tight, and that there is no air leak between the retainer and transmission case faces. If the reverse unit engages properly as above, the trouble would be in the control valve assembly. However, if there was a successive leak in the reverse unit or the friction clutch cone did not apply properly the trouble must be in the reverse unit of the transmission. If pressure is still below specifications the trouble is most probably in the valve body, pressure regulator, or connecting passages.

If trouble is isolated to the reverse unit, it will be necessary to remove the transmission from the car to correct it. With the transmission on the bench, remove parking brake bracket, rear pump and rear bearing retainer. Completely disassemble the reverse unit. Remove the reverse clutch piston seals. Inspect oil passages and inner and outer clutch piston sealing surfaces. Check reverse clutch oil passage in the case with air to be certain it is not blocked and does not leak.

Check control valve assembly.

If no defect has been found by the foregoing procedure, the leak or malfunction is probably in the valve body. The valve body assembly can be checked by replacing it with one which is known to be good.

TESTING FOR NOISES

Hydra-Matic transmissions are relatively quiet in operation. However, they do make a certain amount of noise, as well as any such unit when operating. One should become familiar with these before testing the transmission. Tune the engine to run smoothly before testing for noise.

Rear Unit Planet Gear Noise

Noisy rear planet gears may be heard as a low growl on idle which increases to a very high-pitched whine when engine speed is increased (selector lever in neutral).

Test for Rear Unit Gear Noise (Car Standing)

Drive car to a reasonably quiet spot. Stop car.

Move selector lever into neutral position.

Listen for noise with engine idling.

Accelerate engine to higher speed.

Rear planet gear whine will increase to a very high pitch as engine speed is increased.

Test for Rear Unit Gear Noise (Car in Operation)

Move selector lever into L range position.

Drive the car shifts in 2nd speed.

Accelerate and decelerate in 2nd speed. Rear planet gear noise will follow car speed and if present will be very noticeable in second gear.

NOTE: *Open the front door and listen. Rear planet gear noise will seem to be transferred down the propeller shaft.*

Move the selector lever back into the D range position and again accelerate through the gears. Rear planetary whine, if present, will be heard in

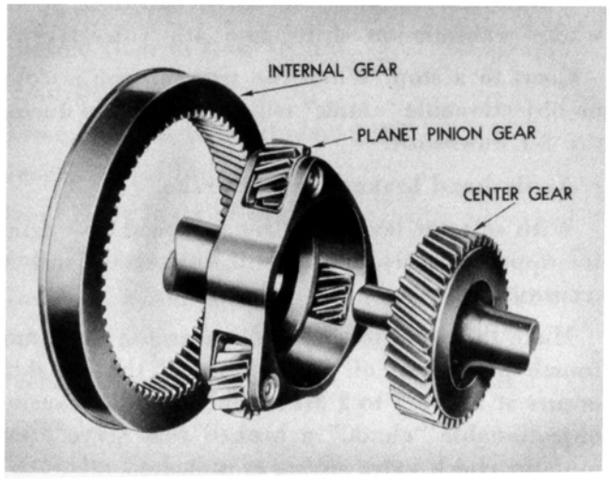


FIGURE 244—*Rear Planet Gears.*

1st and 2nd speed, and will disappear after transmission shifts into 3rd or 4th speed (rear unit is then in direct drive).

NOTE: *Where no objectionable low growl in neutral is heard while engine is idling and only a very slight whine is heard when engine speed is increased, which disappears when selector lever is placed in D range position, no attempt should be made to eliminate the slight whine.*

The three units responsible for rear planetary noise are the center gear on the main shaft, rear planet pinions on the output shaft and the rear unit internal gear.

Front Unit Planet Gear Noise

Front unit planet gear noise is similar to front pump noise, but of a higher pitch. To test for front planet noise, start the engine, place the selector lever in D position. Start the car in motion. If front planet gears are noisy, whine will be heard in first speed and disappear after transmission shifts into second speed. The cause is probably worn or nicked planet pinion gears, center gear, front drive gear, worn pinion needle bearings, or thrust washers.

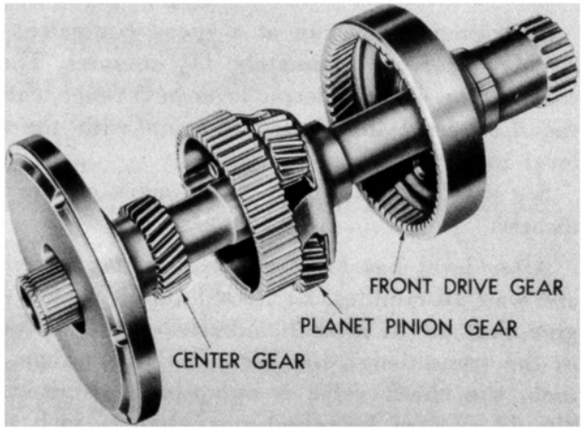


FIGURE 245—*Front Planet Gears.*

Reverse Planet Gear Noise

Reverse planet gear noise, if present, will be heard in reverse, only when car is under ACCELERATION, in this case noise is in the reverse planet assembly.

NOTE: *Due to the ratio of the reverse gears and engine speed when accelerating in reverse, it is doubtful that reverse gear noise will ever become objectionable.*

NOTE: *Reverse noise on DECELERATION ONLY, is caused by noisy rear unit planet gears (see rear unit planet gear noise).*

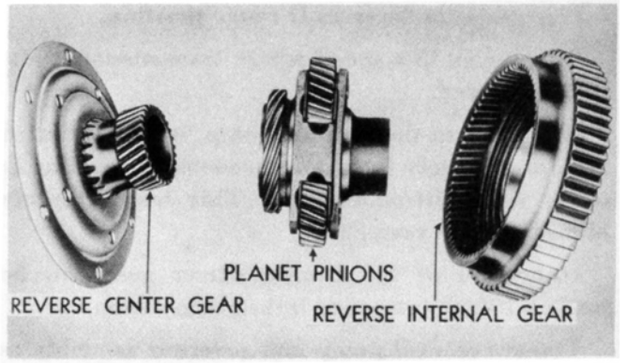


FIGURE 246—*Reverse Planet Gears.*

Scraping Torus Members

Scraping torus members can be identified by a metallic scraping at the front of transmission. If this noise is present it may be caused by:

Main shaft nut not tightened.

Main shaft nut lock plate broken or not bent over. Either one of the above conditions may permit the driven member to strike the flywheel.

Rear Oil Pump Noises (Cross Drive Noise)

Rear oil pump noise may be heard as a high pitched whine much like light axle noise, but not sensitive to throttle opening, drive, float and coast.

REAR OIL PUMP WHINE in most cases will be heard at 20 to 30 MPH. It is seldom heard below 20 MPH. Rear axle whine may be audible at other speeds.

Tests for Rear Oil Pump (Cross Drive) Noise

Drive the car to determine at what speed noise is heard.

After noise is first heard, increase car speed approximately 10 MPH above that point. Move selector lever to neutral, turn off the ignition and coast down through the range in which noise was heard.

NOTE: *With the ignition off, the front oil pump is not running. If noise is still present and was not sensitive to engine speed, the noise is in the rear oil pump.*

If there is any doubt between axle noise and rear oil pump noise, the following test will eliminate the area axle.

Disconnect Torque Tube and propeller shaft.

Lift right corner of front floor mat.

Remove transmission oil level indicator.

Place selector lever in D range position.

Run engine to a speed where transmission shifts into 4th speed.

If noise is in the rear oil pump, it will be heard at approximately the same speedometer reading as when road testing the car. This test definitely eliminates the rear axle.

Inspection of the bronze driver gear can be made without removing transmission from car.

Remove rear oil pump and governor assembly as described in Minor Services and Repairs Section.

Examine bronze gear for deep running groove, remove the transmission, remove and disassemble reverse unit assembly and replace the bronze gear as per instructions in "Repair" Section.

Test for Rear Oil Pump Inner Gear Noise

Rear pump inner gear noise is similar to cross drive noise but is heard in the form of a low growl and is usually heard at speeds above 35 MPH. If rear pump inner gears are noisy, the bushings may be worn permitting gears to contact bores in pump body. In this case, a new pump will need to be installed. Refer to "Minor Services and Repairs."

TEST FOR BROKEN REAR SERVO CHECK VALVE

When the rear servo check valve is broken, the 3-1 shift is rapid and produces a severe "clunk."

With engine idling (375 RPM) move selector lever from neutral to the D range position. A broken check valve will cause rapid rear band application causing the car to lunge forward.

With transmission cold, drive car to a speed where transmission shifts into 4th (direct).

Coast to a stop. When the transmission is cold, no objectionable "clunk" will be noticeable during the 3-1 downshift.

Apply hand brake and foot brake.

With selector lever in D range, speed up engine for approximately one minute to heat up oil in transmission.

Make the same test as outlined in the third and fourth paragraph of this subject. If the 3-1 shift occurs at above 7 to 2 MPH and is severe, causing objectionable "clunk," a broken rear servo accumulator check valve spring is indicated.

No attempt should be made to eliminate a slight bump felt only when the transmission is cold and which disappears when the transmission is warm. See "Replacement of Rear Servo Accumulator Check Valve" in "Repair" Section. If accumulator check valve is not broken check tightness of rivet. If rivet is loose replace valve and rivet as instructed in "Repair" Section. Check for free operation of plunger in body. If sticky, free up plunger.

TEXT FOR MISSING OR STICKING TORUS CHECK VALVE

A missing or sticking torus check valve will cause the engine to speed up excessively when starting away after the car has been standing.

Determine the effectiveness of the torus check valve by checking the rate at which fluid drains back from the coupling into the transmission.

Set hand brake lever tightly.

Start engine and run at a speed equivalent to 20 MPH for approximately 1½ minutes. Then, with engine idling, selector lever in D range, check the fluid level in the transmission with the oil level indicator.

See that fluid is at the "Full" mark on the indicator.

After level has been checked, shut off engine and wait 10 minutes. Recheck fluid level with engine shut off. If after 10 minutes, the fluid level in the transmission has not raised more than ½ inch, the check valve is operating satisfactorily. Should oil level be raised more than ½ inch, the check valve is not operating satisfactorily and should be replaced.

HYDRA-MATIC TRANSMISSION SECTION

RECOMMENDED TORQUE TIGHTNESS FOR BOLTS

	Thread Size	Torque Ft. Lbs.
Internal Gear to Rear Drum	#10-24	3-4
Front Body to Inner Body	#10-24	3-4
Outer Body to Inner Body	#10-24	3-4
Rear Cover to Inner Body	#10-24	3-4
Front Body Plate to Body	#10-24	3-4
Rear Plate to Outer Body	#10-24	3-4
Governor Bushing Retainer to Governor Body	#10-24	3-4
Detent Retainer to Outer Valve Body	#10-24	3-4
Front Servo Assembly	1/8 Pipe	6-7
Torus Cover Drain	1/8 Pipe	6-7
Case—Oil Pressure Take-off	1/8 Pipe	15-18
Front Servo Assembly	1/4 Pipe	6-7
Front Pump Cover to Body	1/4-20	12-15
Intake Pipe to Front Pump	1/4-20	10-12
Governor Body to Drive Flange	1/4-20	6-8
Rear Pump Cover to Body	1/4-20	6-8
Control Valve Assembly to Case	1/4-20	6-8
Side Cover to Case	1/4-20	10-12
Front Servo Body to Cylinder	1/4-20	6-8
Blocker Piston Retracting Spring to Bracket	1/4-20	6-8
Outer Throttle Lever	1/4-28	10-12
Torus Check Valve Retainer	1/4-28	6-8
Oil Pan to Case	5/16-18	10-13
Front Cover to Case	5/16-18	10-13
Drive Flange to Rear Drum	5/16-18	10-13
Rear Servo Spring Retainer to Body	5/16-18	10-13
Reverse Shifter Bracket to Case	5/16-18	15-18
Rear Pump to Case	5/16-18	15-18
Outer Shifter Lever	5/16-24	10-13
Torus Cover to Flywheel	5/16-24	30-35
Front Servo to Case	3/8-16	23-28
Rear Servo to Case	3/8-16	23-28
Rev. Int. Gear Support to Rear Bearing Support	3/8-16	28-33
Rear Bearing Support to Case	3/8-16	28-33
Center Bearing Cap to Case	7/16-14	40-50
Bolt—Reverse Anchor Support	7/16-20	23-28
Band Adjusting Screw Lock Nut	1/2-20	40-50
Oil Pan Drain Screw	5/8-18	35-45
Trans. Mainshaft Nut	7/8-16	50-60
Pressure Regulator Valve Plug	1 1/16	40-50

THRUST WASHERS—SPECIFICATIONS, LOCATION AND PURPOSE

The following chart covers the specifications, location and purpose of the various thrust washers used in the Hydra-Matic Transmission.

O.D.	I.D.	Thickness	Material	Location and Purpose
1.812 1.822	1.374 1.379	.088 .092	Steel— I.D. tang	Between the bronze washer in front of the Front Unit Drive Gear and the snap ring on the Front Planet Carrier (Intermediate Shaft) behind the Drive Torus. Purpose—To act as a bearing surface for the bronze thrust washer.
1.815 1.822	1.377 1.384	.087 .091	Bronze	Between the front of the Front Unit Drive Gear and the steel washer. Purpose—It takes the forward thrust of the Front Drive Gear.
1.910 1.917	1.377 1.384	.087 .091	Bronze	Between the rear of the Front Drive Gear and the front of the Front Planet Carrier. Purpose—To take the rear thrust of the Front Drive Gear. Also use—Between the rear of the Front Unit Center Gear and the steel washer (with locating flat) on the Intermediate shaft. Purpose—To take the rear thrust of the Front Unit Center Gear.
$1\frac{15}{16}$	1.374 1.377	.088 .092	Steel— I.D. tang	Between the snap ring on the Front Planet Carrier (Intermediate Shaft), in front of the Oil Delivery Sleeve and the bronze thrust washer behind the Front Unit Center Gear. Purpose—To act as a bearing surface for the bronze thrust washer.
2.872 2.878	$1\frac{15}{16}$	.087 .091	Bronze	Between the rear of the Rear Unit Clutch Drum and in front of the Rear Unit Clutch Hub. Purpose—To take the rear thrust of the Rear Clutch Drum and the forward thrust of the Front Planet Carrier (Intermediate Shaft). Also use—Between the rear of the Rear Clutch Hub and the front of the Rear Unit Center Gear. Purpose—To take the rear thrust of the Front Planet Carrier (Intermediate Shaft) and the forward thrust of the Mainshaft.

THRUST WASHERS—SPECIFICATIONS, LOCATION AND PURPOSE (Continued)

O.D.	I.D.	Thickness	Material	Location and Purpose
2.247 2.253	1	.055 .059	Bronze	Selective. Between the rear of the Mainshaft and the front of the output shaft. Purpose—To take the rear thrust of the Mainshaft. (Note: Mainshaft end play is controlled by this washer.)
2.247 2.253	1	.063 .067	Bronze	
2.247 2.253	1	.071 .075	Bronze	
2.247 2.253	1	.079 .083	Bronze	
2.247 2.253	1	.087 .091	Bronze	
2.247 2.253	1	.095 .099	Bronze	
2.591 2.596	1 11/16	.087 .091	Bronze	Between the steel washer in front of the Reverse Center Gear and the Output Shaft. Purpose—To take the forward thrust of the Rear Drum and Internal Gear.
2 7/16	1.499 1.504	.049 .052	Steel	Between the front of the Reverse Center Gear and the bronze thrust washer behind the Output Shaft. Purpose—To furnish a bearing surface for the bronze thrust washer.

GENERAL SPECIFICATIONS

Main Shaft End Clearance	.004″-.015″
Oil Seal Rings ..... Installed Gap	.0005″-.010″
Except oil delivery sleeve rings	.001″-.007″
Rear Pump Drive Retaining Pin	
Height of peened end of pin must not exceed	.070″
Transmission Case Front Pump Cover	
With gasket in place and pump assembly installed in case, with attaching screws tight, front pump cover should protrude beyond front of case	.003″-.015″
Reverse Internal Gear Backlash	
When using tool J-2587 as per instructions indicator reading must be	.016″-.049″
Governor Runout	
Governor runout, taken with governor, governor sleeve and oil control valve assembly installed must not exceed	.005″
Governor Flange Runout	
Flange runout, taken with the governor removed, must not exceed	.002″
Throttle Lever Location	
With throttle lever installed (draw bolt tight) and lever moved to its extreme rear position dimension from rear machined face of transmission case to center of lever clevis pin hole must be (Use Tool J-2545A)	$7\frac{15}{16}'' \pm \frac{1}{64}''$
Torus Cover Hub Runout	
When mounted on Flywheel, Torus Cover hub runout must not exceed	.005″
Flywheel Runout	
The facial runout of the gasket seal surface of the flywheel, when mounted on crankshaft, must not exceed	.005″
Torus Member Clearance	
Clearance between Drive and Driven Torus members when assembled	.036″-.127″ does not include .015″ facial runout of torus members.
Front Pump Pressure	
See Testing Main Line Oil Pressure	
Oil Capacity and Change Interval	
Drain oil pan and torus cover and refill	11 qts.
Drain, disassemble, assemble transmission and refill	12 qts.
Change transmission oil every	25,000 miles
Band Adjustment Interval	
Initial band adjustment at 1,000 mile inspection. Thereafter no specific interval is established for band adjustment. Transmission bands should be adjusted any time malfunction indicates adjustment is necessary.	
Rear Axle Ratio	
"Ambassador" Series	3.15-1 (13-41)
"Statesman" Series	3.3-1 (13-43)

TECHNICAL SERVICE LETTER REFERENCE

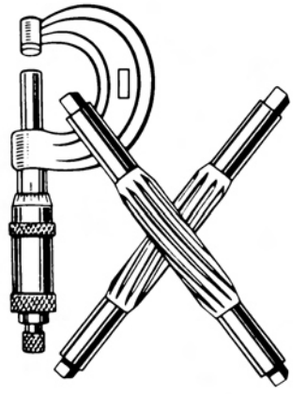
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TECHNICAL SERVICE MANUAL



SHIFTING SYSTEM SECTION

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"RAMBLER" SERIES 11

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SHIFTING SYSTEM

SHIFTING SYSTEM SECTION

ADJUSTING THE SHIFTING MECHANISM

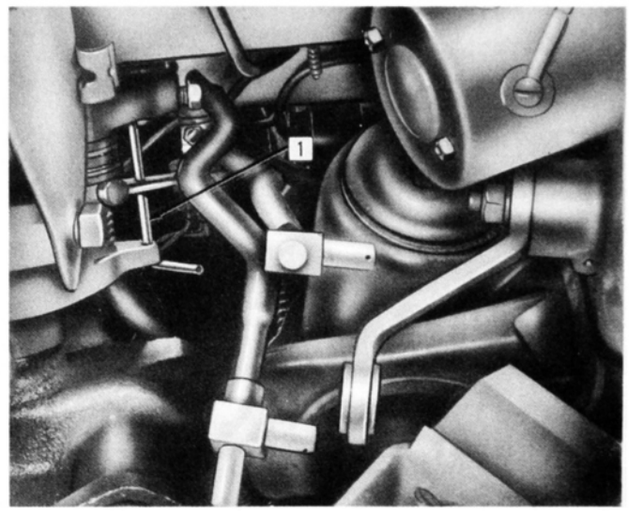
"Ambassador" and "Statesman" Series (except Hydra-Matic)

Place the gear shift lever in the neutral position. Disconnect the gear shift rods at the transmission shift levers, and place the levers in a neutral position.

Install an aligning tool by inserting in the small holes in the gear shift operating levers and the grooves of the bearing housing. A 3/16" (.1875") diameter rod *can* be used as an aligning pin.

With the aligning tool in position and the transmission shift levers in neutral, adjust the shifting rods at the transmission end. After the rods have been adjusted and again connected to the shift levers, remove the aligning tool.

CAUTION: *Be careful not to move the transmission levers out of the neutral position as the adjustment is being made.*



1. Aligning Pin

FIGURE 1—*An Aligning Pin is Used to Retain the Operating Levers in a Neutral Position While Adjusting the Shifting Rods.*

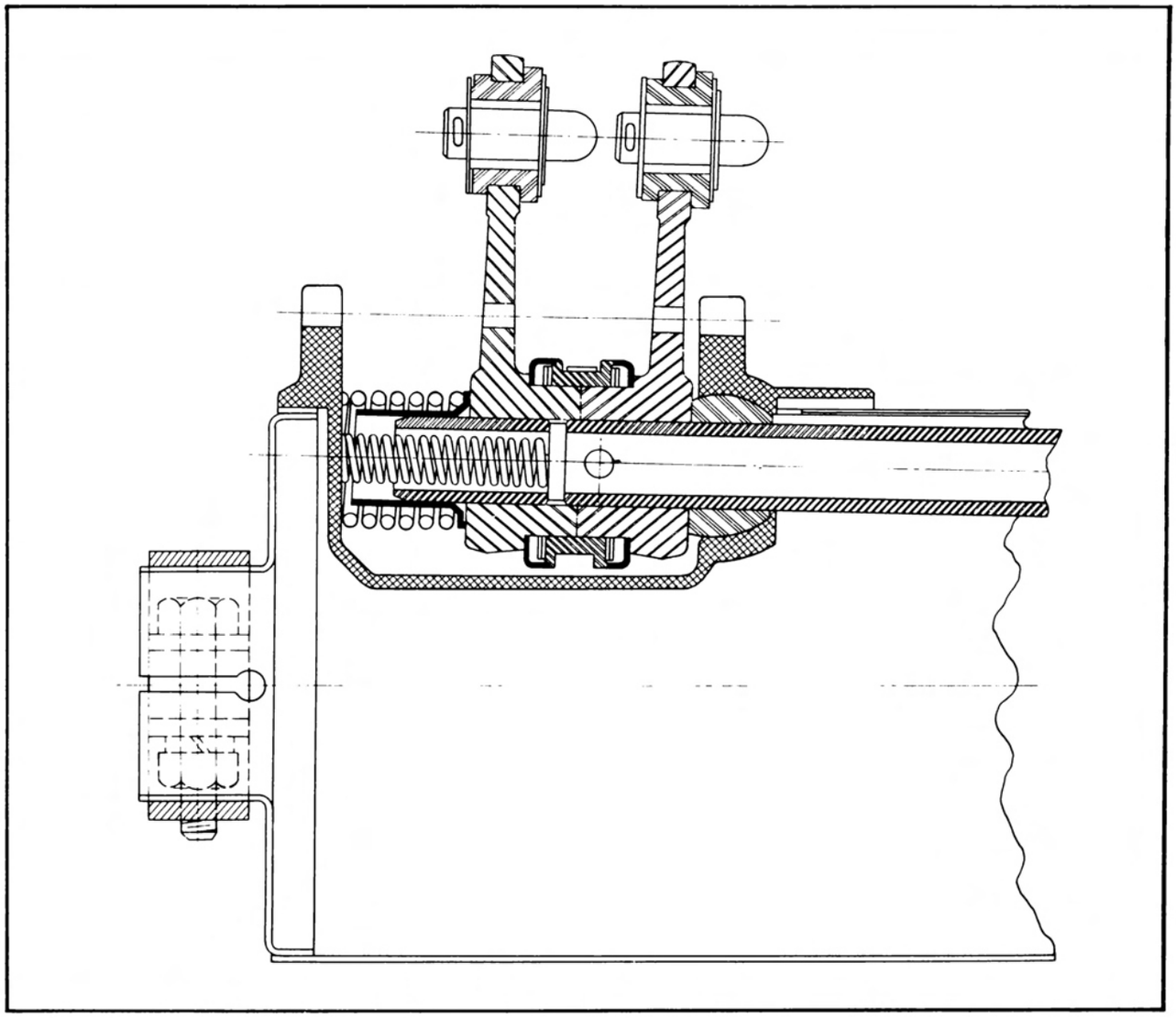


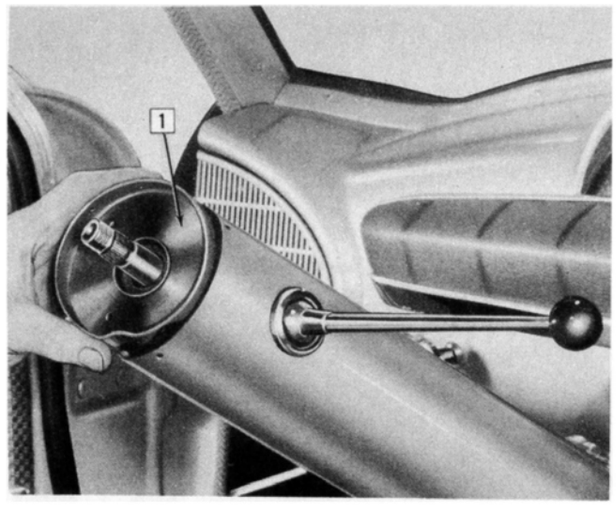
FIGURE 2—*Gear Shift Operating Levers and Bearing Housing Assembly.*

DISASSEMBLING THE SHIFTING MECHANISM

"Ambassador" and "Statesman" Series (except Hydra-Matic)

If it should be necessary to remove the shifting mechanism from the steering jacket tube, first remove the horn blowing parts. Then remove the steering wheel nut and pull the steering wheel.

Remove the metal screws that hold the bearing retainer to the steering jacket tube, and remove the bearing retainer (Fig. 3).



1. Bearing Retainer

FIGURE 3—*Lift Bearing Retainer From the Steering Jacket Tube.*

If equipped with directional signals, disconnect the six wire terminals under the dash. Tag each wire for ease of identification at time of assembly.

Slide the rubber grommet upward on the jacket tube and fold the floor mat over toward the center of the floor. Then slide the rubber insulator pad up to the rubber grommet.



FIGURE 4—*Removing Clutch and Brake Pedals and Opening Cover.*

Remove the metal screws from the clutch and brake pedal opening cover and slide the cover up on the pedal shafts. Loosen the pedal cap screws and remove the pedals and cover (Fig. 4).

Disconnect the gear shift rods from the gear shift operating levers. Loosen the clamp bolt at the lower end of the jacket tube and steering gear housing.

On the "Ambassador" Series, remove the upper and lower front steering gear mounting bolts. Loosen the lower rear bolt about two turns and do not remove. On the "Statesman" Series, remove the three upper bolts and loosen the lower bolt. This will permit the jacket tube assembly to be lowered for removal.

Disconnect the steering gear jacket tube bracket at the instrument panel, and remove the jacket tube and shifting assembly by raising it through the floor opening and over the steering gear tube (Fig. 5).

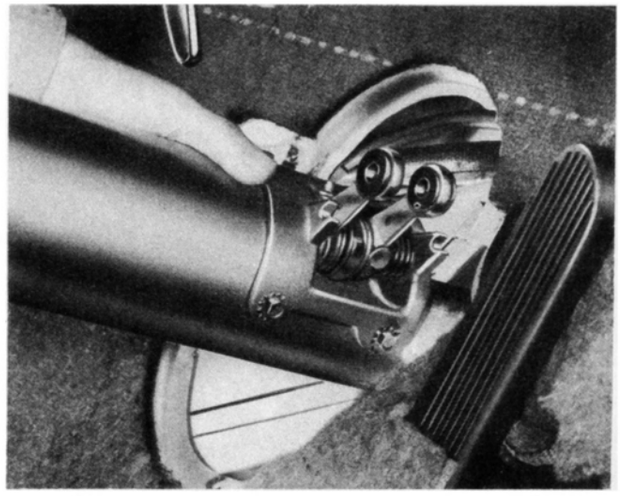


FIGURE 5—*Removing the Steering Gear Jacket Tube and Shifting Assembly.*

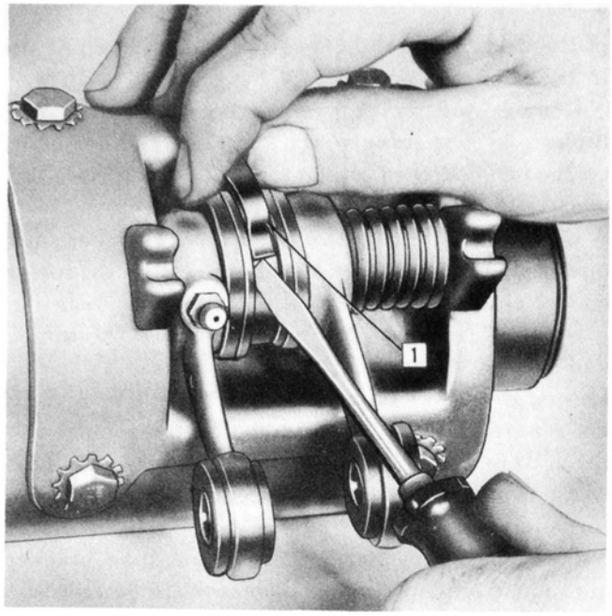
Place the jacket tube assembly on a cloth covered bench to protect the paint surface. Then remove the dirt seal spacer retainer (Fig. 6).

Remove the two halves of the dirt seal spacers (Fig. 7).

Turn the operating levers upward, and with a small punch or drift, push the selector pin out of the operating shaft; turn the levers down, and remove the pin from the second and high operating lever (Fig. 8).

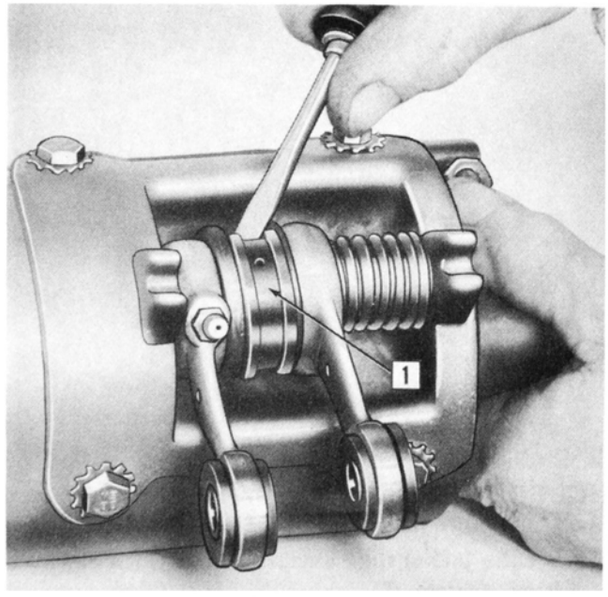
NOTE: *The selector pin can only be removed through the machined notch on the second and high operating lever; this lever contains the lubrication fitting.*

Remove the gear shift lever knob. A machined flat is provided for a 3/8" wrench to remove the gear shift lever.



1. Dirt Seal Spacer Retainer

FIGURE 6—*Removing Dirt Seal Spacer Retainer.*



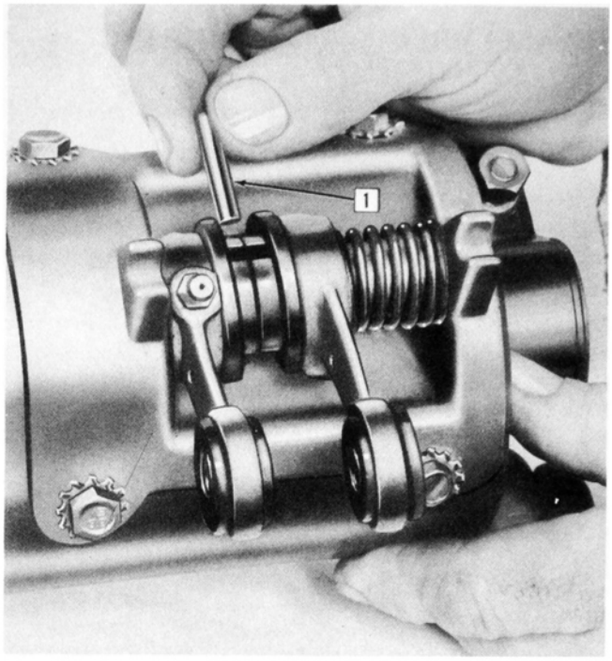
1. Dirt Seal Spacer

FIGURE 7—*Removing Dirt Seal Spacers.*

Remove the gear shift operating shaft by lifting it out of the jacket tube (Fig. 9). The operating levers, outer spring, and spacer will remain in the bearing housing at the lower end of the jacket tube after the operating shaft is removed. The inner spring may remain in the lower end of the operating shaft.

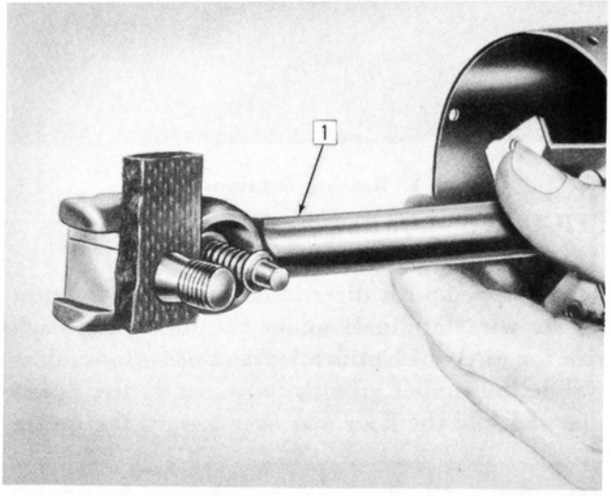
Remove the gear shift operating levers, spacer, outer spring, and bronze fulcrum from the bearing housing (Fig. 10).

Now remove the dirt seals from the operating levers.



1. Selector Pin

FIGURE 8—*Removing the Selector Pin.*



1. Gear Shift Operating Shaft

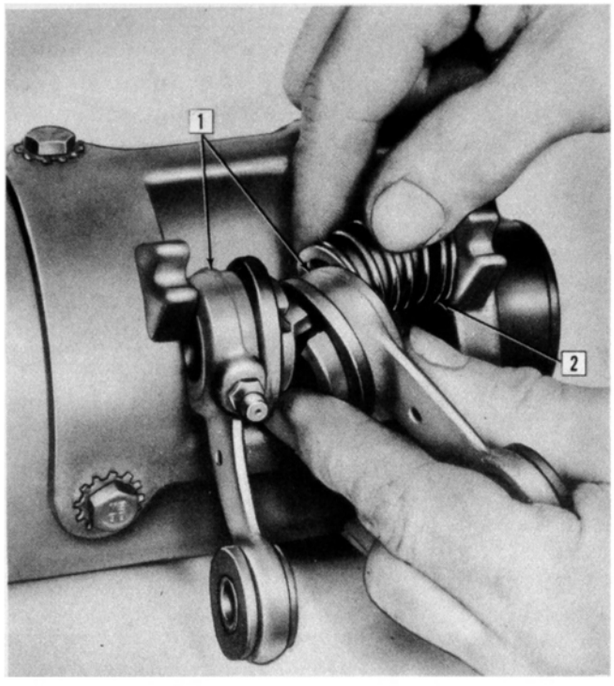
FIGURE 9—*Removing Gear Shift Operating Shaft.*

To complete the disassembly of the shifting mechanism on "Ambassador" and "Statesman" Series equipped with standard or overdrive transmissions, remove the bearing housing from the jacket tube.

ASSEMBLING THE SHIFTING MECHANISM

"Ambassador" and "Statesman" Series (except Hydra-Matic)

Install the gear shift operating bearing housing on the jacket tube. Replace the dirt seals on both gear shift operating levers locating the metal side



1. Gear Shift Operating Levers
2. Spacer and Outer Spring

FIGURE 10—*Removing Operating Levers and Component Parts.*

of the seal toward the selector pin groove. This is to provide a hard bearing surface for the pin.

Apply a coat of lubriplate to the bronze fulcrum and place it in the bearing housing. Then insert the second and high, and reverse operating levers, outer spring, and spacer in the bearing housing (Fig. 10).

Install the inner spring (holding it in place with lubriplate) in the lower end of the operating shaft and insert the shaft, from the top of the jacket tube, down through the bronze fulcrum and shift levers (Fig. 9).

Align the operating shaft selector pin hole with the slot in the second and high shift lever, and insert the selector pin (Fig. 12).

Then install the two dirt seal spacers and dirt seal spacer retainer.

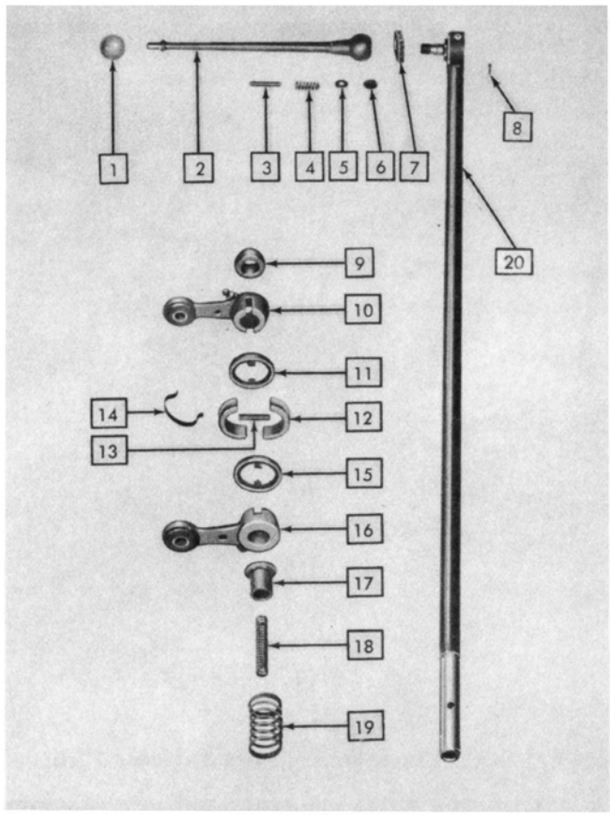
Apply lubriplate to the pressure spring pin. Apply lubriplate to the ball end of the gear shift lever and tighten the lever to the operating shaft. Install the gear shift lever ball.

Apply a coat of lubriplate to the rubber grommet at the lower end of the jacket tube. Then install the jacket tube assembly as shown in Figure 13.

Align the jacket tube assembly and attach the bracket to the instrument panel. Tighten the clamp bolt at the lower end of jacket tube and steering gear housing.

Install the shifter rods to the gear shift operating levers.

Then install the bearing retainer (Fig. 14), the steering wheel, and horn blowing parts.



1. Lever Ball
2. Gear Shift Lever
3. Pressure Spring Pin
4. Pressure Spring
5. Pressure Spring Washer
6. Pressure Spring Washer Cushion
7. Gear Shift Damper
8. Cotter Pin
9. Operating Shaft Bronze Fulcrum
10. Gear Shift Operating Lever
11. Dirt Seal
12. Dirt Seal Spacer
13. Selector Pin
14. Dirt Seal Spacer Retainer
15. Dirt Seal
16. Gear Shift Operating Lever
17. Spacer
18. Inner Spring
19. Outer Spring
20. Operating Shaft

FIGURE 11—*Steering Post Shifting Assembly.*

NOTE: *If equipped with directional signals, connect wires to their respective terminals.*

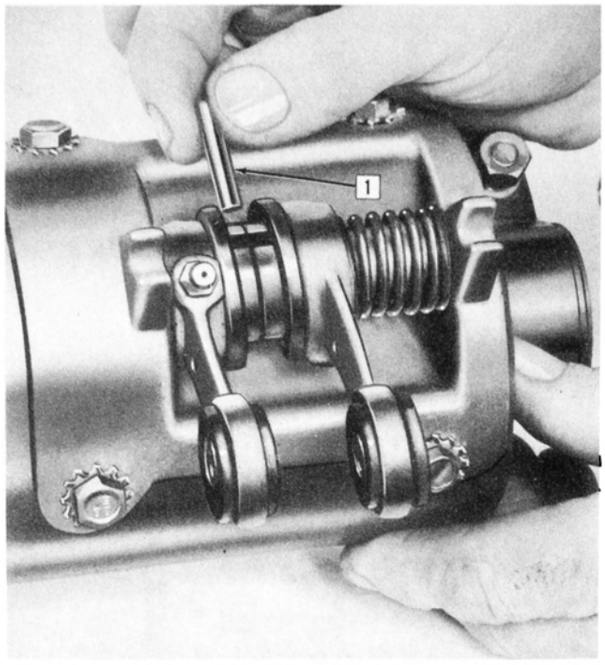
Replace the clutch and brake pedal assembly and insulator grommet. Fold the floor mat back in place and slide the rubber grommet tight against the floor mat. Tighten the jacket tube bracket, locking it in place with pal nuts.

Pressure lubricate the operating shift levers. Then adjust the shift mechanism.

DISASSEMBLING THE HYDRA-MATIC SHIFTING MECHANISM

"Ambassador" and "Statesman" Series

Remove the horn blowing parts and pull the steering wheel. Then remove the gear shift lever knob and lever.



1. Selector Pin

FIGURE 12—*Installing the Selector Pin.*

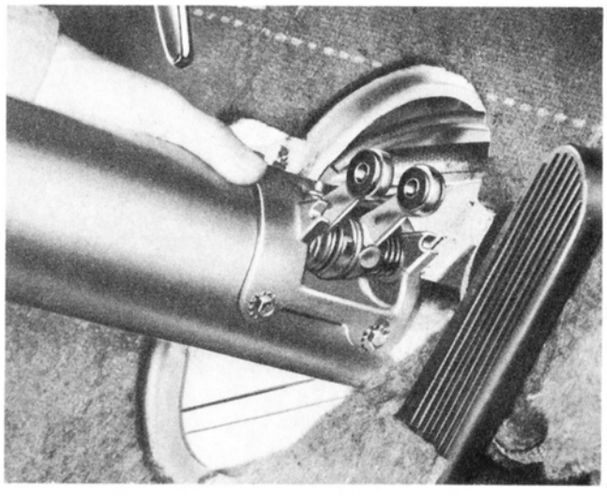


FIGURE 13—*Installing the Jacket Tube and Shifting Assembly.*

Remove the metal screw retaining the selector pointer light shroud to the jacket tube, and raise the shroud from the tube (Fig. 15). Disconnect the light socket, wire, and bulb assembly to remove the shroud.

Remove the bearing retainer from the jacket tube. If directional signal equipped, remove the two screws that hold the directional signal switch to the bearing retainer prior to removing the retainer.

Slide the rubber grommet up on the steering jacket tube and fold the floor mat toward the center of the floor. Slide the rubber insulator pad to the rubber grommet.

Remove the brake pedal opening cover mounting screws. Then move the cover toward the brake pedal,

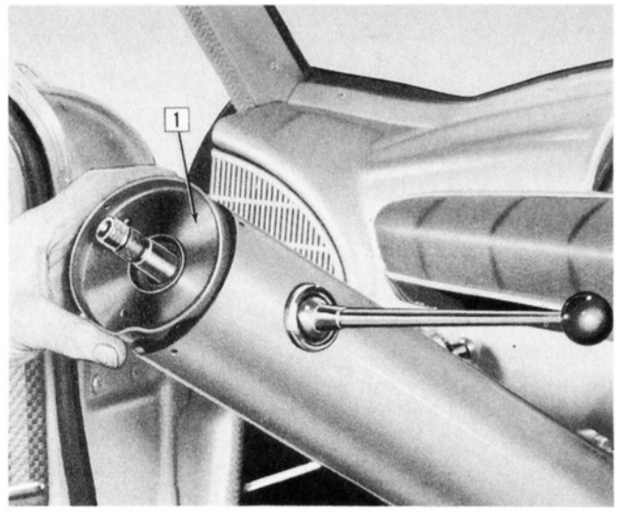


FIGURE 14—*Installing the Bearing Retainer.*

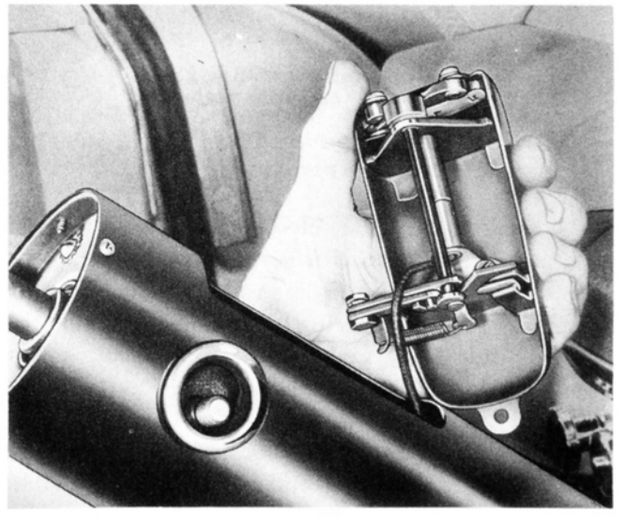


FIGURE 15—*Removing the Shift Selector Pointer Light Shroud.*

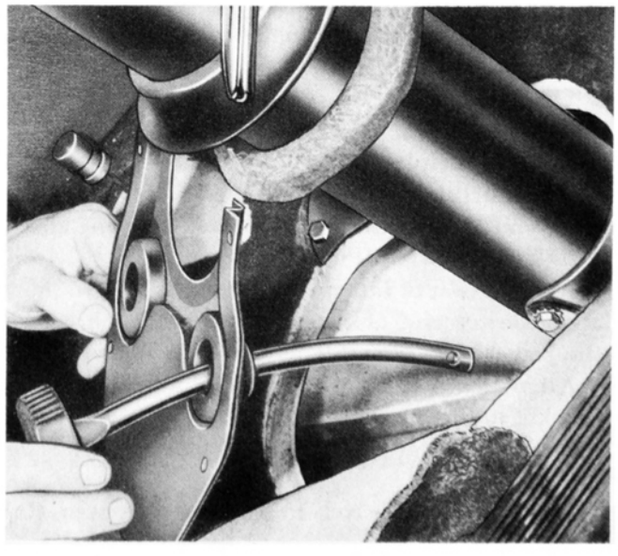


FIGURE 16—*Removing Brake Pedal and Opening Cover.*

loosen the cap screw on the brake pedal, and remove the cover and pedal as an assembly (Fig. 16).

Disconnect the transmission control rod by removing the cotter pin and lifting the rod out of the operating lever (Fig. 17).

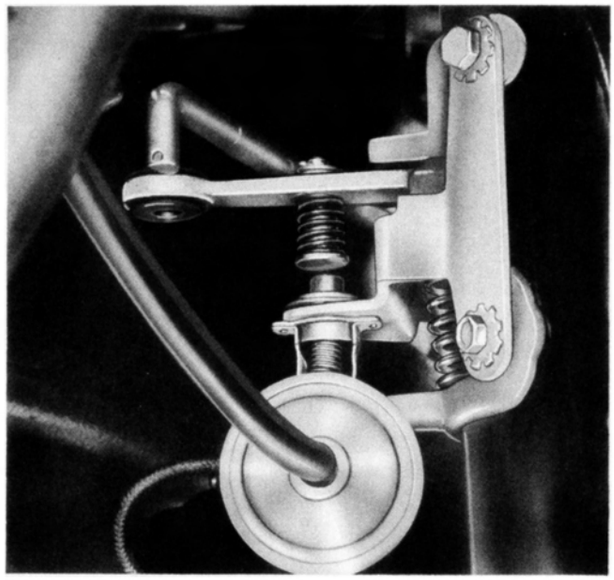
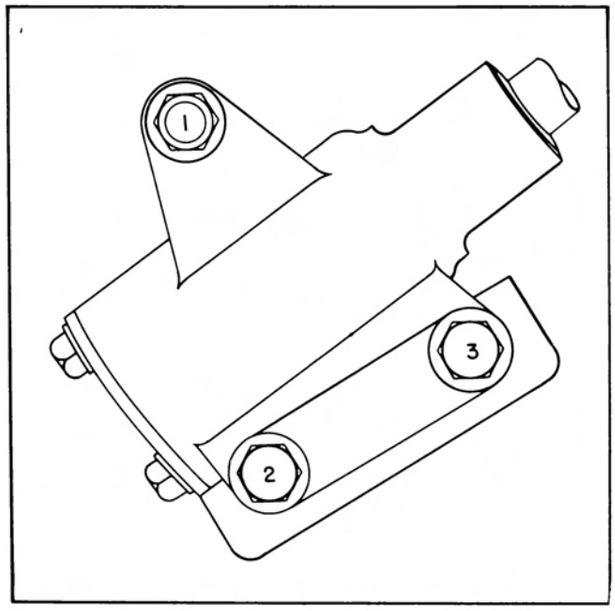


FIGURE 17—*Remove the Cotter Key and Control Rod From the Shift Lever.*

Disconnect the starter switch from the operating shaft starter housing.

On the "Ambassador" Series, remove the upper and lower front bolts from the steering gear housing and side sill. Loosen the lower rear bolt about two turns but do not remove (Fig. 18). On the "Statesman" Series, remove the three upper bolts and loosen the lower bolt. This will permit the jacket tube to be lowered for removal of the shifting mechanism.

Disconnect the jacket tube bracket at the instrument panel, and lower the jacket tube and steering gear assembly to provide clearance to the gear shift housing at the opening in the floor. Remove the two cap screws and two metal screws from the gear shift



1. Upper Attaching Bolt
2. Lower Front Attaching Bolt
3. Lower Rear Attaching Bolt

FIGURE 18—*Location of Steering Gear Housing to Side Sill Bolts "Ambassador" Series.*

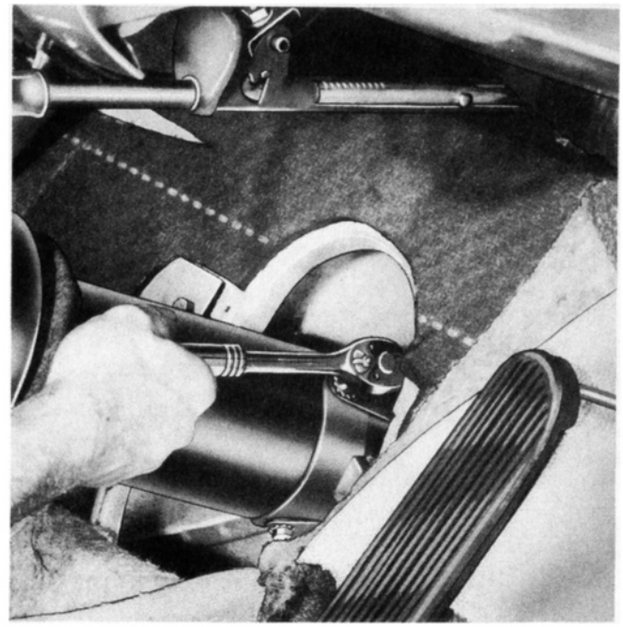
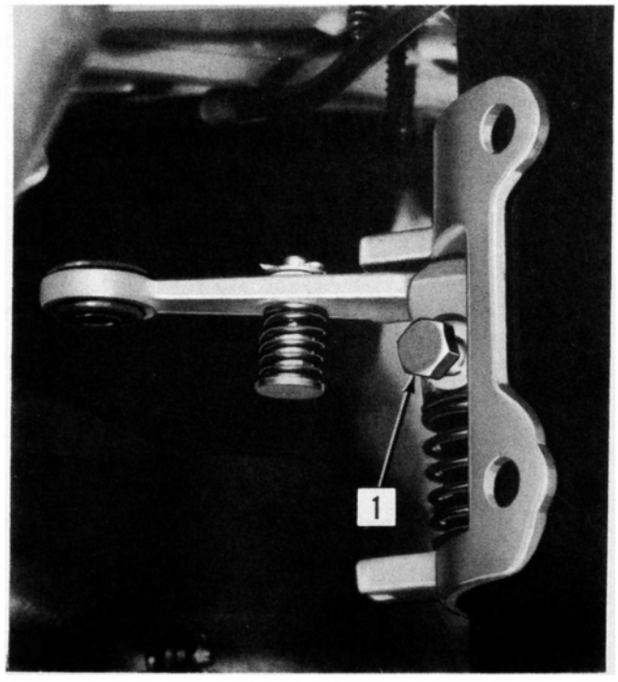


FIGURE 19—*Removing Metal and Cap Screws From Gear Shift Housing.*



1. Fastening Bolt

FIGURE 20—*Remove the Operating Shaft Fastening Bolt.*

housing, and remove the gear shift starter housing (Fig. 19).

Remove the operating shaft fastening bolt (Fig. 20).

Then remove the gear shift operating shaft from the upper end of the jacket tube (Fig. 21).

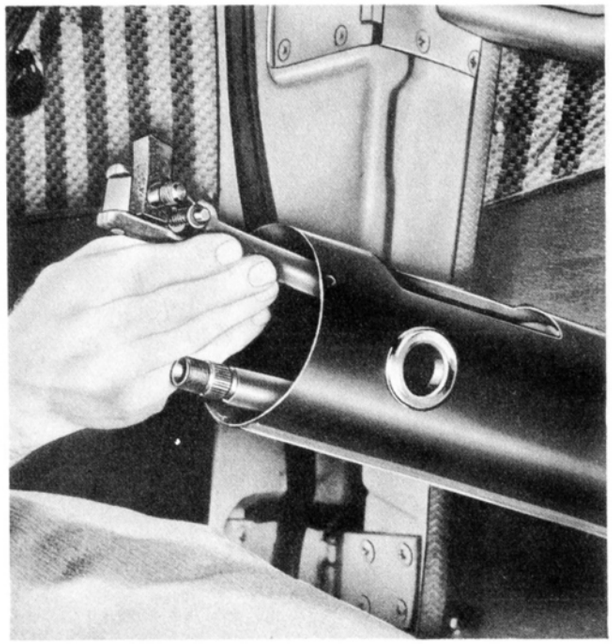


FIGURE 21—*Removing the Gear Shift Operating Shaft.*

Remove the gear shift housing assembly (Fig. 22).



FIGURE 22—*Removing the Shift Housing Assembly.*

Remove the starter switch plunger and spring assembly from the operating lever. Then remove the operating lever, upper spring, lower spring, and bronze fulcrum from the bearing housing (Fig. 23).

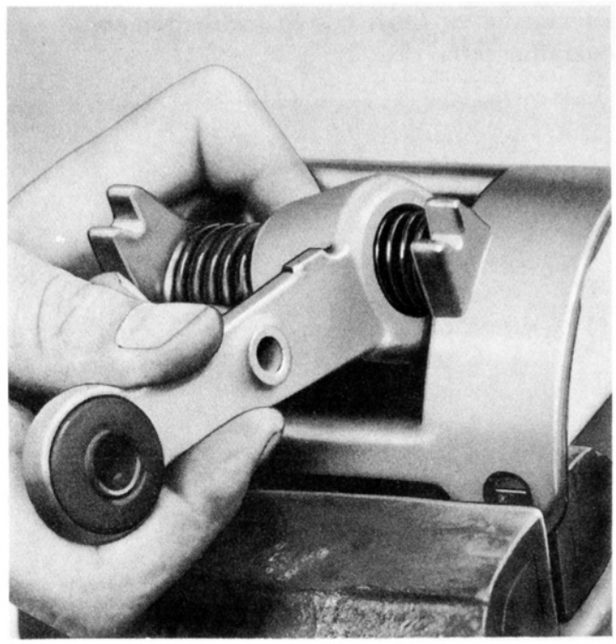


FIGURE 23—*Removing Gear Shift Operating Lever and Component Parts.*

Remove the gear shift pressure pin and spring assembly from the gear shift operating shaft. This completes the disassembly of the Hydra-Matic shifting mechanism.

To disassemble the gear shift selector pointer light shroud assembly, remove the anchor nut and screw from the shroud; then remove the tension spring, anchor, and operating arm. Remove the pointer shaft retaining lock ("hairpin") and press or pry the gear selector pointer off of the shaft with a screw driver. To reassemble, reverse the above procedure.

NOTE: *The pointer can be aligned on the shaft without removing by holding the pointer shaft, and turning pointer on shaft. Parts shown in Figure 24.*

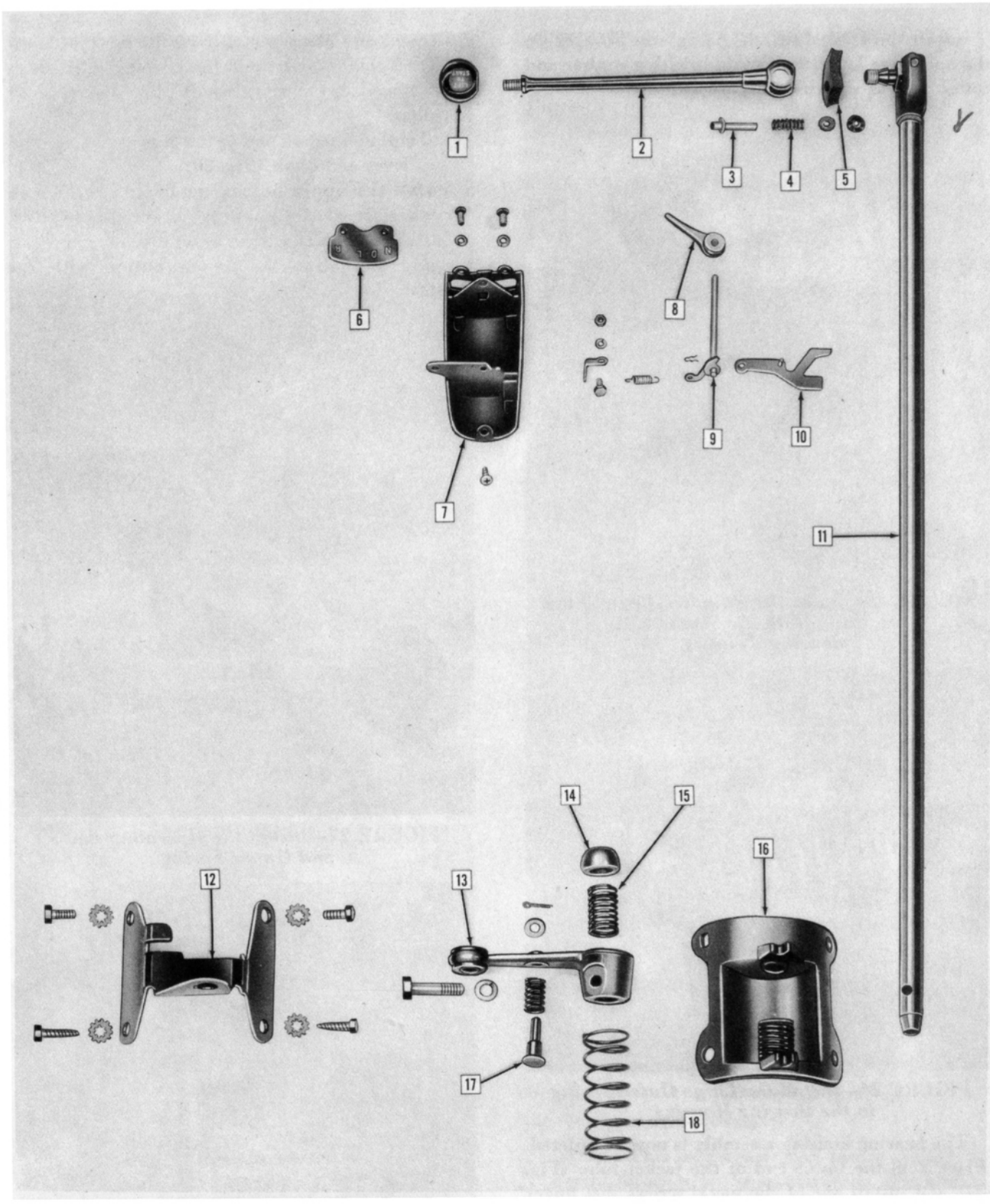
ASSEMBLING THE HYDRA-MATIC SHIFTING MECHANISM

Apply lubriplate to the bronze fulcrum and install the rounded edge of the fulcrum to index with the seat in the bearing housing (Fig. 25).

Install the large outer spring over the lower spring and retainer which is riveted to the bearing housing (Fig. 26).

With the large outer spring in position in the bearing housing, compress the spring enough to install the operating lever and upper spring (Fig. 27).

SHIFTING SYSTEM SECTION



1. Gear Shift Lever Knob
2. Gear Shift Lever
3. Gear Shift Pressure Spring Pin
4. Gear Shift Pressure Spring
5. Gear Shift Lever Vibration Damper
6. Gear Selector Dial
7. Gear Selector Pointer Shroud
8. Gear Selector Pointer
9. Gear Selector Pointer Shaft
10. Gear Selector Pointer Pickup Lever
11. Gear Shift Operating Shaft
12. Gear Shift Operating Shaft Starter Housing
13. Gear Shift Operating Lever
14. Gear Shift Operating Shaft Fulcrum
15. Gear Shift Operating Shaft Upper Spring
16. Gear Shift Operating Shaft Housing
17. Gear Shift Starter Switch Plunger
18. Gear Shift Operating Spring Outer

FIGURE 24—*Hydra-Matic Shifting Mechanism Assembly Sequence.*

Install the starter switch spring and plunger on the operating lever, and retain it with a washer and cotter pin, as shown in Figure 28.

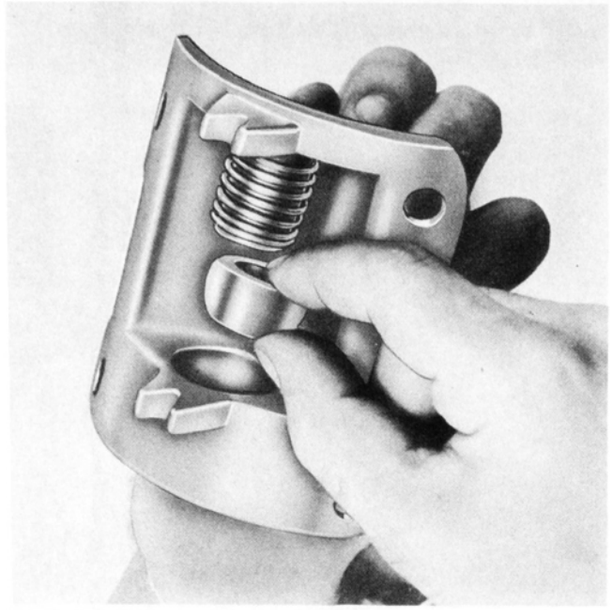


FIGURE 25—*Index the Rounded Edge of the Fulcrum With the Seat in the Bearing Housing.*

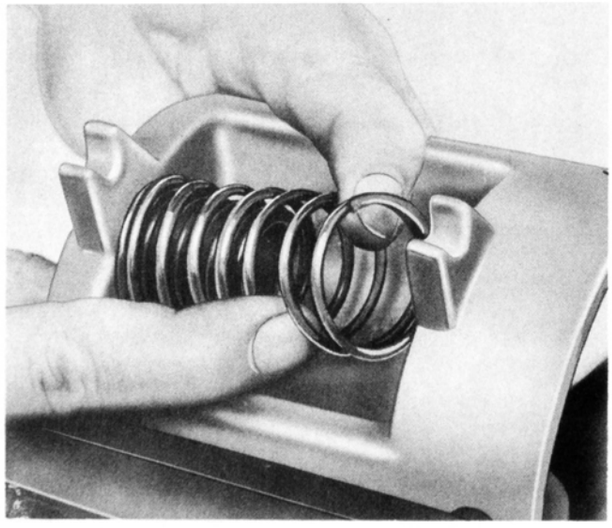


FIGURE 26—*Install the Large Outer Spring in the Bearing Housing.*

The bearing housing assembly is now completed. Place it in the lower end of the jacket tube (Fig. 29) and install one of the metal screws just finger tight to hold the housing in position.

Install the gear shift pressure pin and spring assembly on the operating shaft and apply lubriplate to the pin. Then install the gear shift lever vibration damper.

Install the operating shaft down through the top of the jacket tube, and align the operating lever bolt hole with the hole in the shaft. Then install the shift lever fastening bolt.

Remove the metal screw from the bearing housing (that temporarily held the housing in position during assembly) and install the starter shaft housing.

Lubriplate the ball end of the gear shift lever and install lever and knob (Fig. 30).

Install the upper bearing retainer. Then install the gear shift selector pointer light shroud assembly.

Install the starter switch on the starter shaft housing and align the switch button with the plunger.

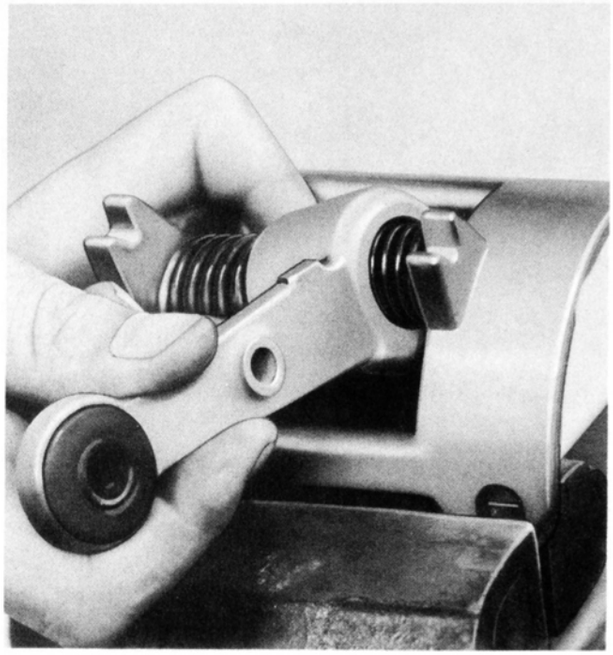


FIGURE 27—*Install the Operating Lever and Upper Spring.*

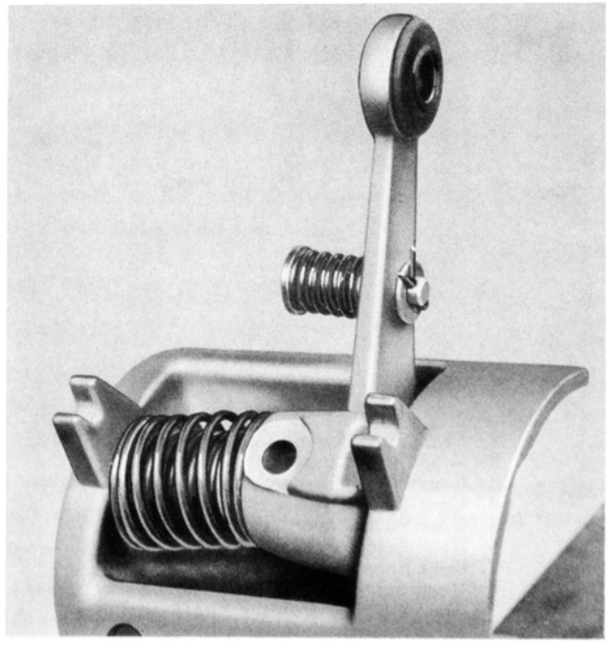


FIGURE 28—*Install Starter Spring and Plunger on the Opreating Lever.*



FIGURE 29—*Install the Bearing Housing on the Lower End of the Jacket Tube.*

NOTE: *The holes in the starter switch housing are elongated for alignment of the starter switch. Set the selector lever in the neutral position when making this adjustment.*

Raise the jacket tube and steering column assembly and fasten the bracket to the instrument panel. Install the steering wheel and horn blowing parts.

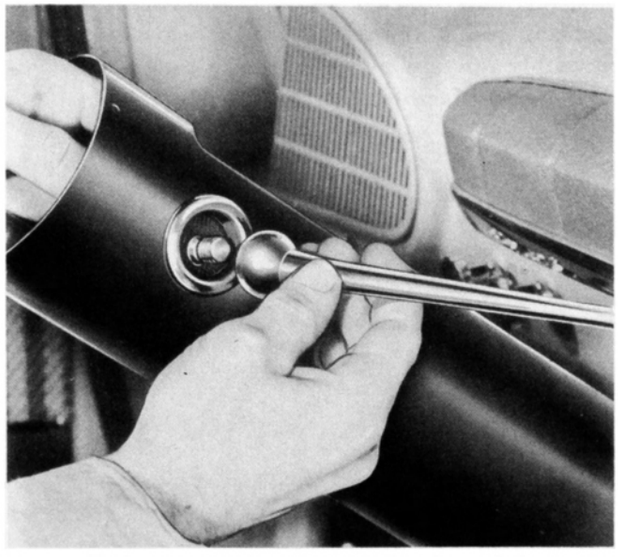


FIGURE 30—*Install Gear Shift Lever and Knob.*

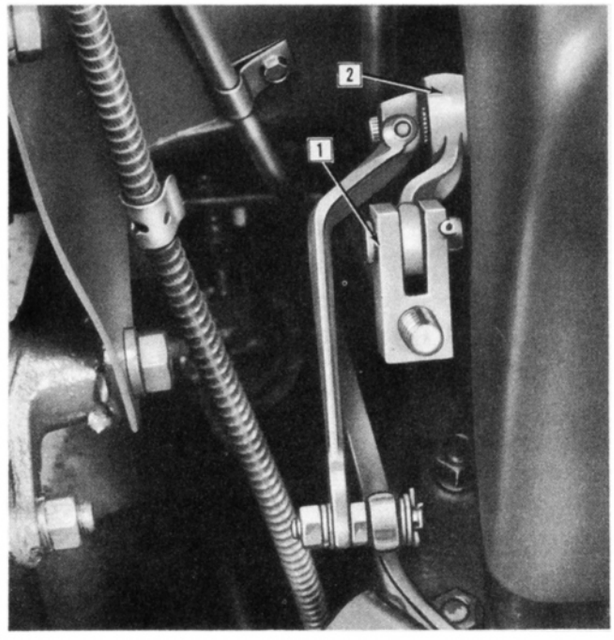
Replace the brake pedal and opening hole cover, rubber insulator pad, floor mat, and rubber grommet.

Then connect the control rod to the shift operating lever.

SELECTOR LEVER LINKAGE ADJUSTMENT

Place the selector lever in the "D-3" position and set the operating lever against the stop on the starter switch bracket.

Remove the clevis pin from the control rod to shift lever at the side of the transmission case (Fig. 31).



1. Control Rod Clevis and Pin
2. Transmission Shift Lever

FIGURE 31—*Control Rod and Transmission Shift Lever.*

Move the shift lever (at transmission) to "D-3" position (third detent from front position). Adjust the pin so that the clevis pin passes freely through the hole in the transmission lever.

NOTE: *Be sure that the operating lever is against the stop on the starter switch bracket.*

After the adjustment has been completed, lengthen the control rod *two full turns* and replace the clevis pin and cotter key.

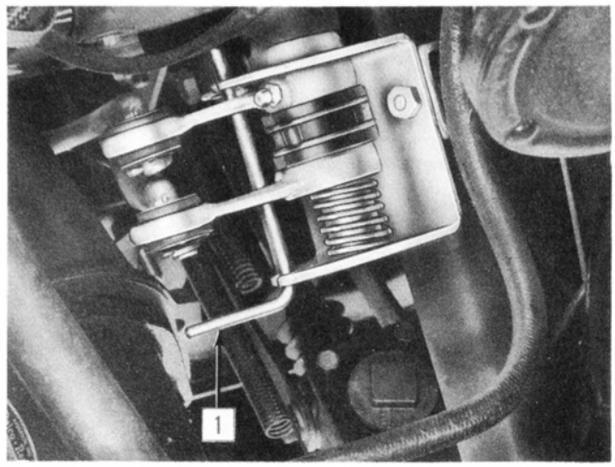
NOTE: *This adjustment will insure proper detent location in the transmission together with a full reverse engagement.*

ADJUSTING THE SHIFTING MECHANISM

"Rambler" Series

Place the gear shift lever in the neutral position. Disconnect the gear shift rods at the transmission shift levers, and place the levers in a neutral position. Install an aligning tool in the small holes in

the gear shift operating levers, and the grooves of the bearing housing. A $^{3}/_{16}$" (.1875") diameter rod can be used as an aligning pin (Fig. 32).



1. Aligning Tool

FIGURE 32—*An Aligning Tool is Used to Retain the Operating Levers in a Neutral Position While Adjusting the Shift Rods.*

With the aligning tool in position and the transmission shift levers in neutral, adjust the shifting rods at the transmission end. After the rods have been adjusted and again connected to the transmission shift levers, remove the aligning tool.

CAUTION: *Be careful not to move the transmission shift levers out of neutral position as the adjustment is being made.*

DISASSEMBLING THE SHIFTING MECHANISM

"Rambler" Series

Remove the gear shift lever knob. Now remove the gear shift lever nut. After the nut is removed, push the lever toward the dash panel. This will loosen the chrome ball permitting it to slide from the lever (Fig. 33).

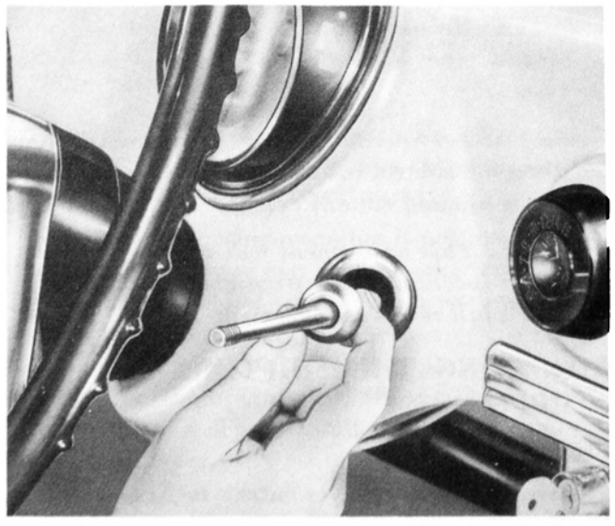
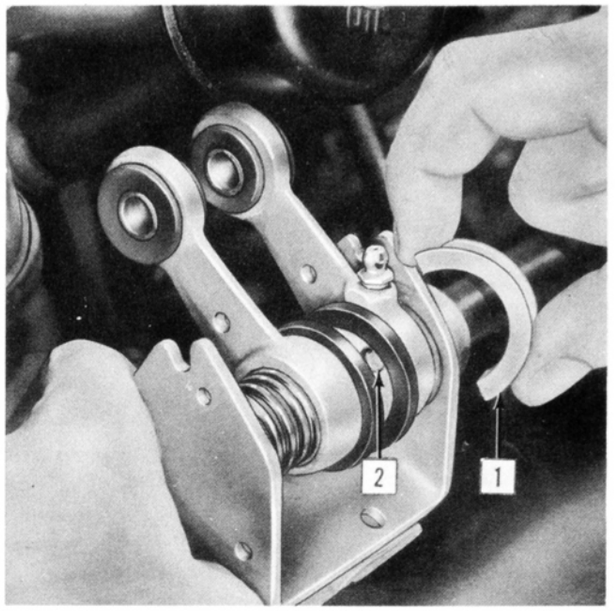


FIGURE 33—*To Remove the Chrome Ball, Push the Gear Shift Lever Toward the Dash Panel.*

Disconnect the gear shift rods from the operating levers at the bottom of the steering jacket tube by removing the cotter pins, and lifting the rods out of the levers.



1. Dirt Seal Spacer
2. Selector Pin

FIGURE 34—*Remove the Dirt Seal Spacer.*

Remove the "U" bolt holding the operating lever housing and bracket to the lower end of the steering jacket tube. The entire bearing housing assembly can now be lowered into the engine compartment to facilitate further disassembly.

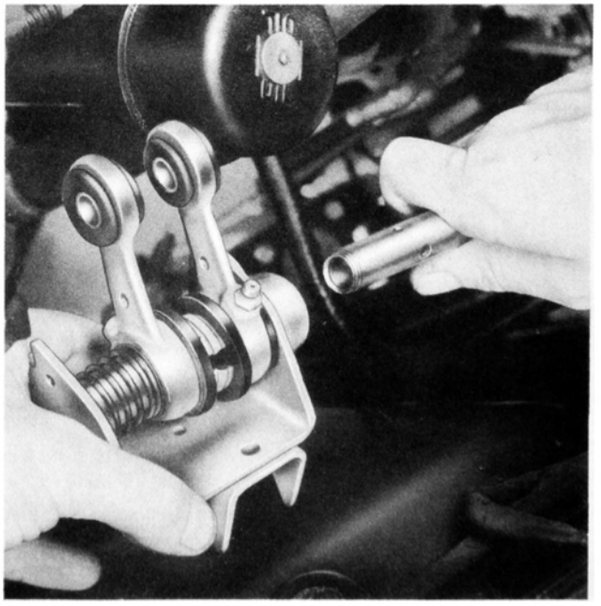


FIGURE 35—*Remove the Operating Lever Housing From the Operating Shaft.*

Remove the dirt seal spacer retainer from between the operating levers, and remove the two halves of the spacer (Fig. 34).

Push out the selector pin part way only from the top, and remove the pin from the underside of the

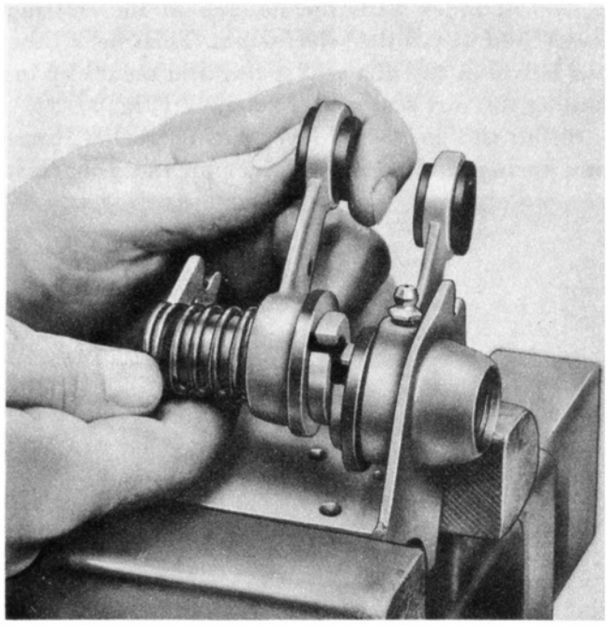
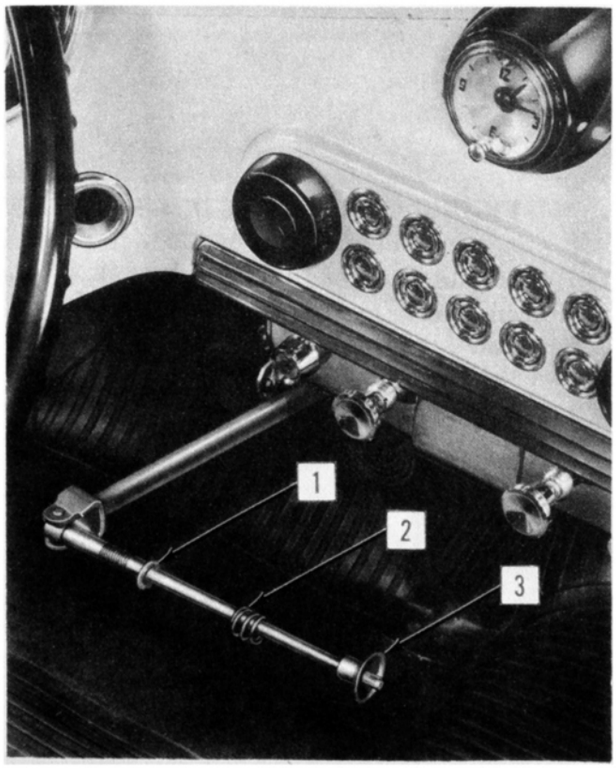
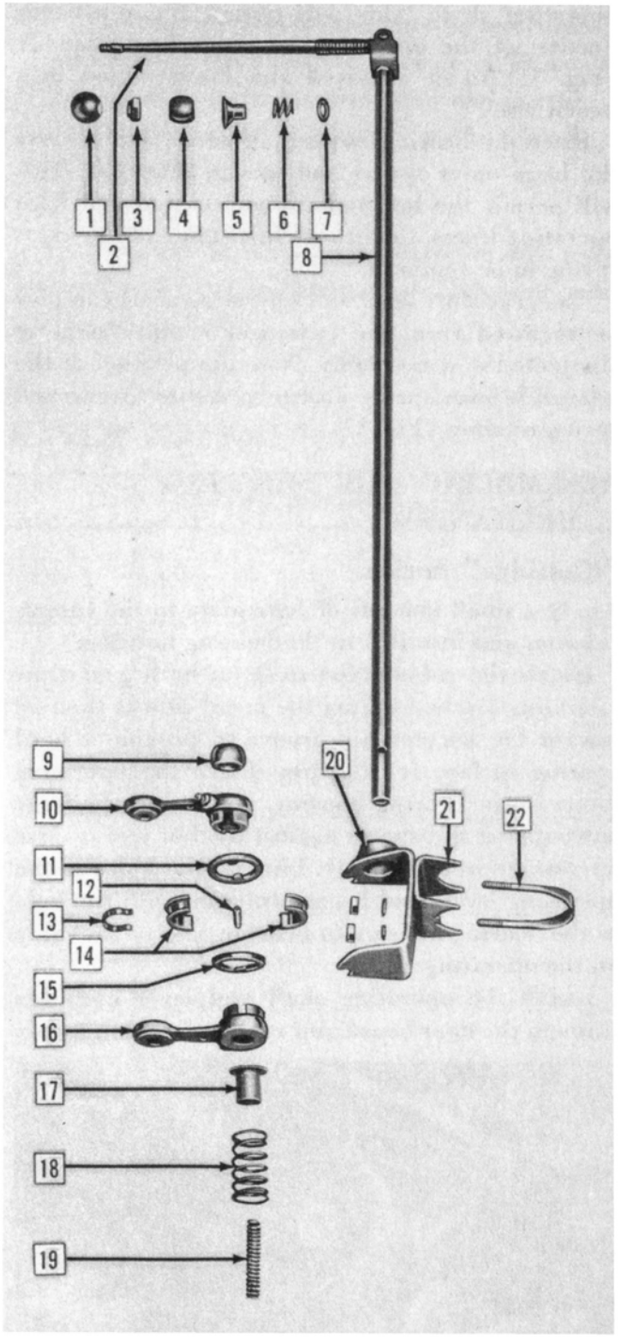


FIGURE 36—*Remove the Large Outer Spring and Spacer.*



1. Spring Washer
2. Pressure Spring
3. Spring Retainer

FIGURE 37—*When Removing the Operating Shaft, Note the Position of the Spring Washer, Pressure Spring, and Spring Retainer.*



1. Lever Ball
2. Gear Shift Lever
3. Lever Nut
4. Chrome Ball
5. Spring Retainer
6. Pressure Spring
7. Washer
8. Operating Shaft
9. Bronze Fulcrum
10. Operating Lever, Second and High
11. Dirt Seal
12. Selector Pin
13. Dirt Seal Spacer Retainer
14. Dirt Seal Spacers
15. Dirt Seal
16. Operating Lever, Low and Reverse
17. Spacer
18. Outer Spring
19. Inner Spring
20. Bearing Housing
21. Bearing Housing Support Bracket
22. "U" Bolt

FIGURE 38—*Steering Post Shift Assembly.*

operating shaft. This will permit the remaining portion of the operating lever housing assembly (Fig. 35) to be removed and disassembled in a bench vise.

Place the bearing housing in a vise and remove the large outer spring and spacer (Fig. 36). This will permit the low and reverse, second and high operating levers, the bronze fulcrum, and the inner spring to be removed.

The gear shift lever and operating shaft can now be removed from the passenger compartment to complete the disassembly. Note the position of the gear shift lever spring washer, pressure spring, and spring retainer (Fig. 37).

ASSEMBLING THE SHIFTING MECHANISM

"Rambler" Series

Apply a small amount of lubriplate to the bronze fulcrum and install it in the bearing housing.

Install the rubber dirt seals on both gear shift operating levers, locating the metal side of the seal toward the selector pin groove to provide a hard bearing surface for the pin. Place the operating levers in the bearing housing, and install the large outer spring and spacer against the low and reverse operating lever (Fig. 36). Line up the holes in the operating levers and bronze fulcrum with the hole in the bearing housing to provide ease of assembly on the operating shaft.

Install the operating shaft and lever assembly through the floor board and rubber dirt seal. Apply lubriplate to the small inner spring and install it in the end of the operating shaft.

Then assemble the bearing housing to the operating shaft (Fig. 39).

Turn the operating shaft so that the hole in the shaft will index with the notches in the shifting levers, and install the selector pin. Then install the two halves of the dirt seal spacer and secure by installing the dirt seal spacer retainer (Fig. 40).

Install the gear shift lever spring washer, pressure spring, and spring retainer on the gear shift lever and guide the lever through the hole in the instrument panel (Fig. 41).

Now install the chrome ball and lever nut. Then replace the gear shift lever ball.

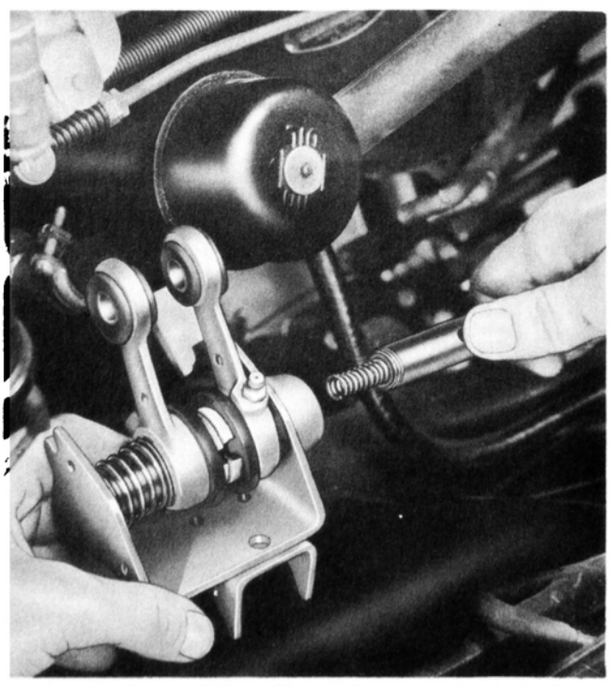


FIGURE 39—*Install the Bearing Housing Assembly on the Operating Shaft.*

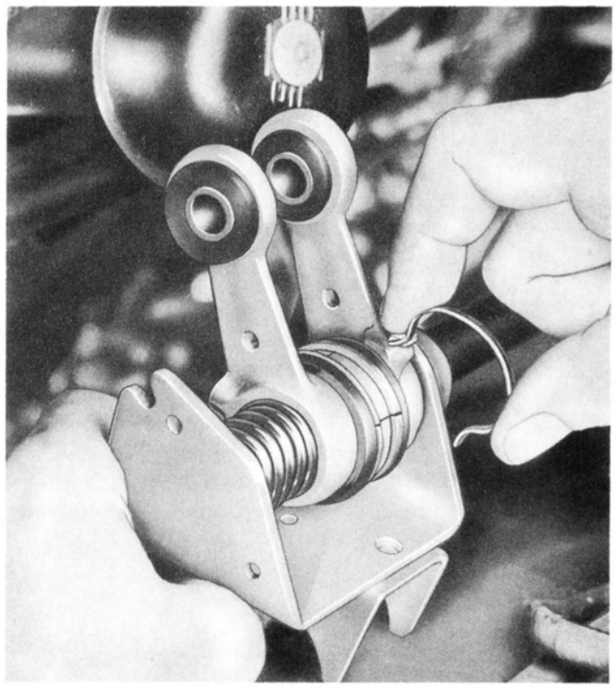


FIGURE 40—*Install the Dirt Seal Spacer Retainer.*

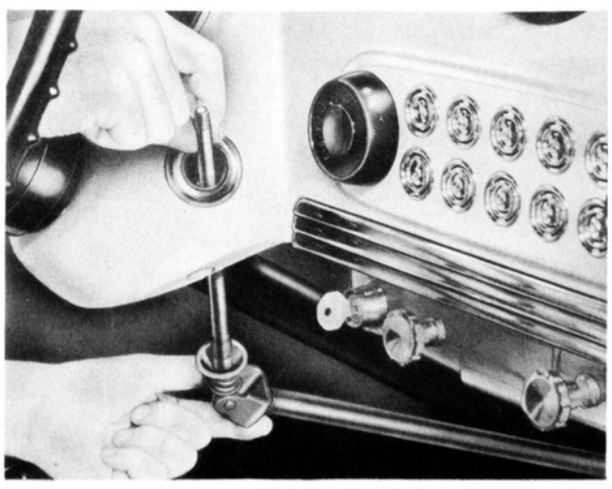


FIGURE 41—*Guide the Gear Shift Lever Through the Instrument Panel.*

Install the "U" bolt holding the bearing housing and support bracket to the lower end of the jacket tube.

NOTE: *Before tightening the "U" bolt securely, place the gear shift lever in the low gear position. Approximately 1½" clearance should be provided between the lever and steering wheel. To obtain this clearance, move the bearing housing up or down on the jacket tube.*

The steering jacket tube may be loosened and turned clockwise, to provide sufficient clearance between the shift lever and instrument panel, when the lever is in the second gear position.

To complete the assembly, replace the shift rods, adjust the shifting mechanism, and lubricate with pressure lubricant.

TECHNICAL SERVICE LETTER REFERENCE

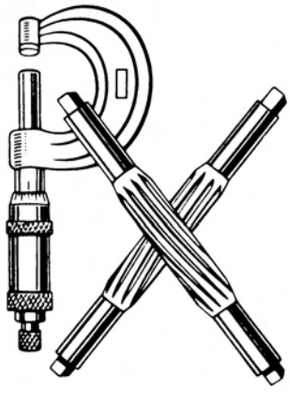
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TECHNICAL SERVICE LETTER REFERENCE

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TECHNICAL SERVICE MANUAL



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BRAKES-WHEELS-HUBS-DRUMS

BRAKES AND WHEELS—HUBS AND DRUMS SECTION

"Ambassador" Series

In this series the Nash-Lockheed Hydraulic System is used in conjunction with the Bendix Servo type brakes.

"Statesman" and "Rambler" Series

The Nash-Lockheed Hydraulic System is used in conjunction with the Bendix floating shoe type brake in these Series.

GENERAL DESCRIPTION

The braking system consists of a combination reservoir and master cylinder in which hydraulic pressure is created by foot-pedal pressure, tubing and flexible hose to convey this pressure to wheel cylinders, and wheel cylinders which have opposed pistons pressing against brakelined shoes. Under pressure from the wheel cylinders, the shoes are expanded outward contacting the inside surface of the brake drums and creating friction which opposes rotation of the wheels.

The brake assembly on each wheel has brake shoe return springs which retract the shoes when operating pressure is relieved. Retraction of the brake shoes forces the pistons back into the wheel cylinders causing the fluid to flow back into the master cylinder reservoir through a compensating port in the master cylinder.

HYDRAULIC SYSTEM

The hydraulic system should be kept free of dirt and moisture. It is advisable to drain the system and flush with pure alcohol once a year.

> CAUTION: *Keep mineral oils, gasoline, or kerosene out of the system as they cause rubber cups to soften, swell, and distort resulting in failure.*

MASTER CYLINDER

The master cylinder (cast integrally with the reservoir) is the compensating type.

It contains the fluid actuating piston, return spring, check-valve, and piston push rod which serves as the linkage between the piston and the brake pedal operating lever. The piston is equipped with a primary cup of synthetic rubber and a secondary cup of the same material (Fig. 1). When extended, the piston push rod is housed in a synthetic rubber boot which serves to keep foreign matter

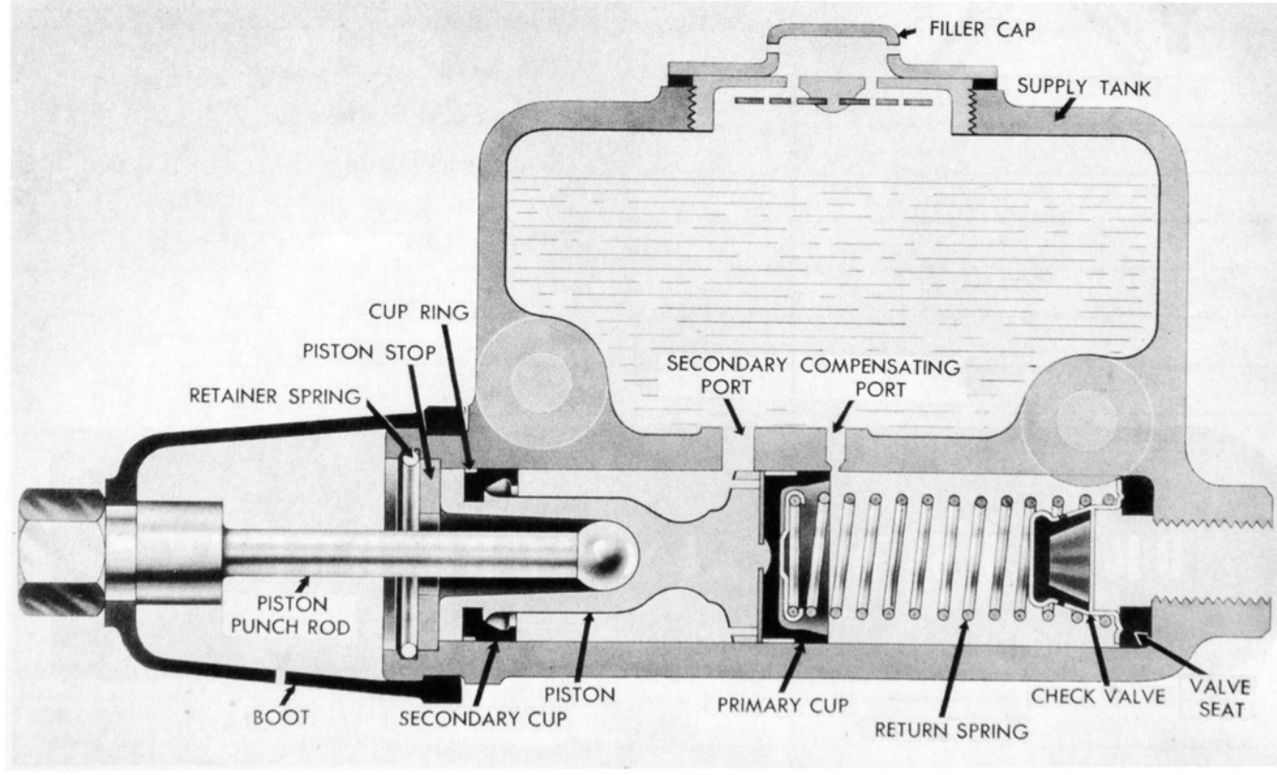


FIGURE 1—*Schematic Drawing, Master Cylinder Operating Parts. (Note That Primary Cup Barely Clears Compensating Port When Fully Retracted.)*

out of the system. The cylinder is equipped with an intake or secondary port and a relief or compensating port opening into the reservoir. The master cylinder performs two functions:

It maintains a constant volume of fluid in the system at all times regardless of heating expansion and cooling contraction, and acts as a pump during the "bleeding" operation.

It permits additional fluid to enter the system to counter-balance any loss due to gravity seepage.

MASTER CYLINDER REMOVAL

Remove the Brake Pedal Return Spring.

Disconnect the master cylinder piston push rod by removing the nut and bolt from the lower fulcrum of brake pedal.

Disconnect two brake lines from "T" connection on rear of the master cylinder.

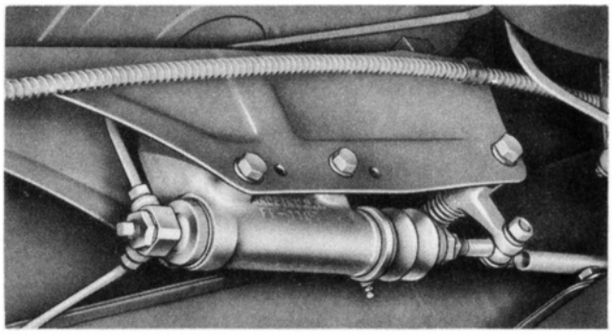


FIGURE 2—*Master Cylinder Removal.*

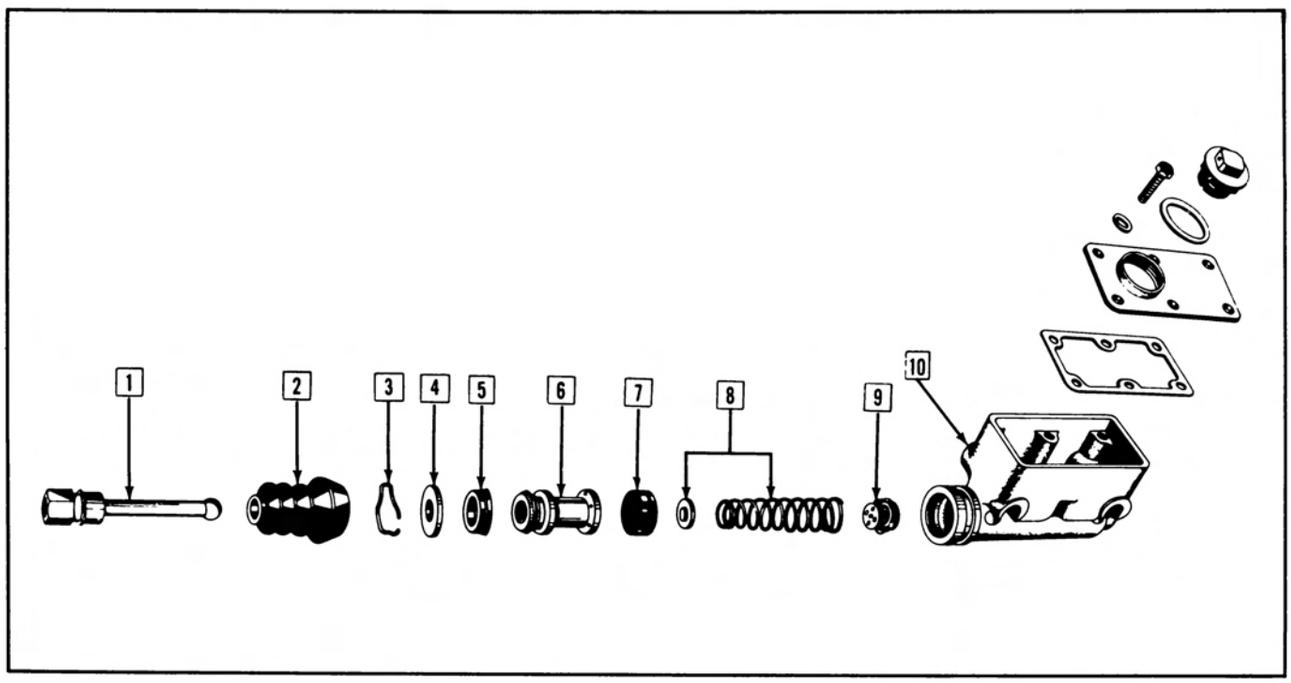
Remove the master cylinder by removing the two bolts from the master cylinder support.

INSPECTION AND ASSEMBLY OF MASTER CYLINDER

After removing the master cylinder, clean all component parts in alcohol. Check secondary and compensating port to be sure both are open. Inspect rubber cups for crimps and scores caused by dirt. Examine the bore of the cylinder body for ragged edges, scores, pits, or rough surfaces. If it is necessary to hone the bore, recheck piston clearance in bore, not to exceed .003″. Inspect the check valve. If it is worn or damaged, the check valve must be replaced. Whenever a master cylinder is disassembled, the primary and secondary cup must always be replaced.

WHEEL CYLINDERS

Each wheel cylinder contains a pair of opposed pistons fitted with rubber cups and a small compression spring to keep the cups tight against the pistons. The fluid pressure keeps the lips of the cups tight against the wheel cylinder walls. In the "Statesman" and "Rambler" Series, the outer ends of the pistons contact the brake shoes to impart the outward braking thrust against the brake drums. The "Ambassador" Series employs a link between the piston and brake shoe.



1. Piston Push Rod
2. Rubber Boot
3. Spring Retainer
4. Piston Stop
5. Secondary Cup
6. Piston
7. Primary Cup
8. Return Spring Assembly
9. Check-Valve Assembly
10. Housing

FIGURE 3—*Master Cylinder Assembly ("Rambler" Series Shown)*

The wheel cylinders are of the straight bore type. The "Ambassador" Series wheel cylinders have a $1\frac{1}{16}$" diameter bore in the front and a $\frac{15}{16}$" diameter bore in the rear. The "Statesman" Series wheel cylinders have a 1" diameter bore in the front and a $\frac{7}{8}$" bore in the rear. The "Rambler" Series wheel cylinder has a 1" diameter bore in the front and a $\frac{13}{16}$" diameter bore in the rear.

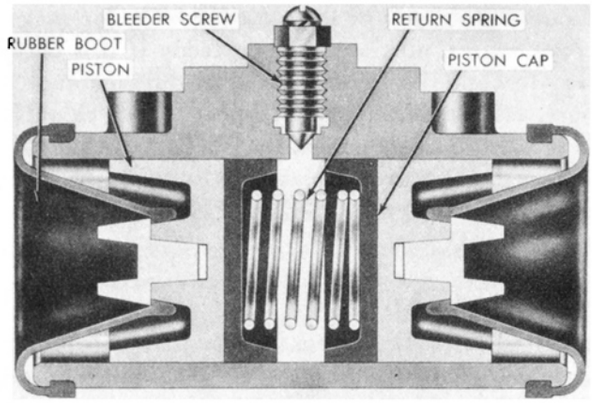
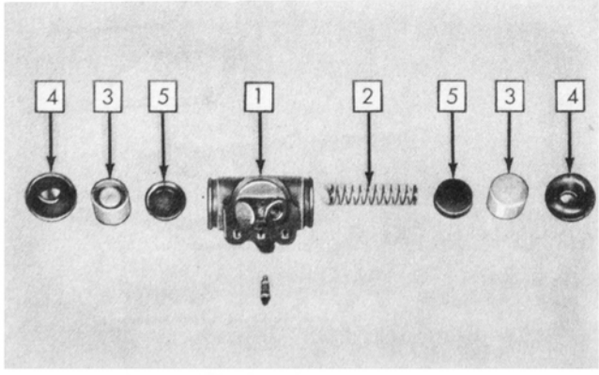


FIGURE 4—*Wheel Cylinder.*

Inspection of Wheel Cylinders

After removing the wheel cylinders from the brake assembly, remove the boots from both ends of the cylinder. The pistons and cups are forced out of the barrel by the compression spring. Inspect the cups for ragged edges and cylinder for smoothness. If the cylinder is scratched or pitted, it will be necessary to hone or replace to prevent loss of fluid or excessive cup wear.

When reassembling the wheel cylinder, all parts must be washed in clean alcohol, then dipped in Genuine Nash-Lockheed Brake Fluid for lubrication. Reassemble the spring, cups, pistons, and boots in the cylinder. New inlet fitting gaskets must be used when connecting the cylinder to the hydraulic system.



1. Housing
2. Return Spring
3. Piston
4. Boot
5. Rubber Cup

FIGURE 5—*Exploded View of Wheel Cylinder.*

BLEEDING HYDRAULIC LINES

Bleeding the entire brake system is necessary whenever a hydraulic line is disconnected from the master cylinder, or whenever the brake pedal is "spongy" on application. If a line is disconnected at one individual wheel, that wheel cylinder only must be bled.

Before bleeding, fill the master cylinder reservoir with Genuine Nash-Lockheed No. 21 Hydraulic Brake Fluid. Keep the cylinder and reservoir full by using a cylinder filler (pressure or static type).

> CAUTION: *While removing the reservoir filler cap, extreme care must be exercised to prevent dirt from entering the reservoir and master cylinder, as dirt lodged between the pistons and the cylinder walls will cause failure during application.*

Attach a bleeder hose and allow it to hang in a clean container, such as a small glass mason jar. Unscrew the bleeder connection $\frac{3}{4}$ turn and depress the foot pedal to floor, tighten bleeder connection, and allow the pedal to return slowly to "off" position. Repeat the pumping action until enough fluid has passed through to expel all the air from the line. Do this at each of the four wheels.

Watch the flow of fluid from the hose, the end of which should be kept below the surface of the fluid; when all air bubbles cease to appear, close the bleeder connection.

It is advisable to lock the bleeder connection at the end of the last pressure stroke. Air then cannot follow into the cylinder during the return of the brake pedal.

Fluid withdrawn in the bleeding operation should not be used again. Fluid should be replenished in the reservoir after each wheel cylinder is bled. Should the reservoir be drained during the bleeding operation, air will enter the system and rebleeding will then be necessary. When the bleeding operation is completed, the reservoir must be refilled to within $\frac{1}{2}$" from the top.

To prevent brake drag, the compensating port (Fig. 1) must be open when the brake pedal is in released position. See "Brake Pedal Adjustment."

It is not necessary to bleed the system when brake shoes are removed for relining or replacement if the hydraulic system is not disturbed. To prevent wheel cylinder pistons from "popping out," use a suitable clamp to retain them.

Pressure type bleeding is also recommended. Use a standard type pressure bleeder following the Manufacturer's instructions.

WHEEL BRAKE UNITS

The wheel brake unit is composed of a dust shield assembly or support plate, two brake shoes, the wheel cylinder, and the brake shoe return springs (Figs. 6 and 7).

BRAKE PEDAL

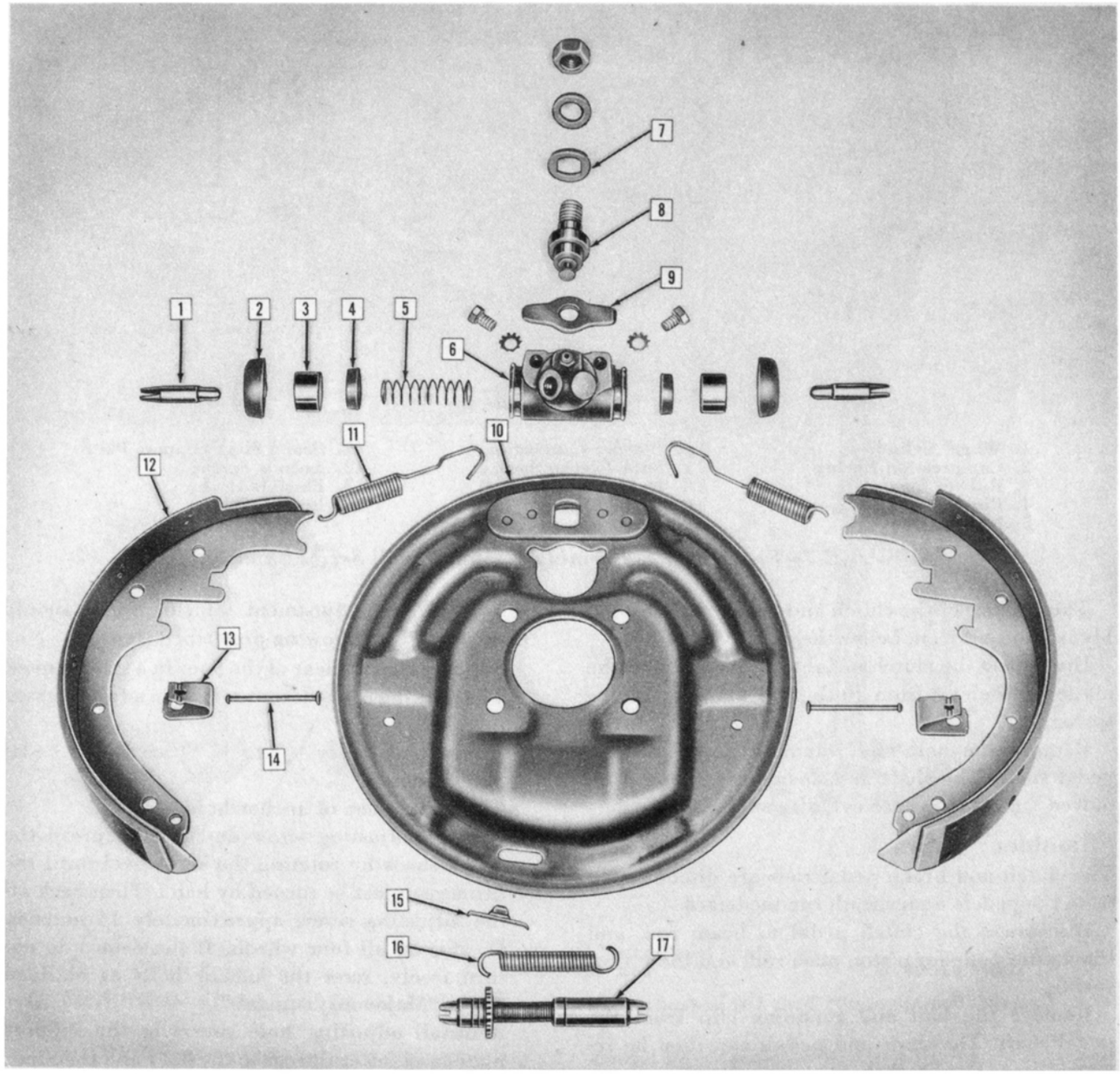
The clutch and brake pedal are of two piece construction and can be removed in sections. They are joined at a point below the floor board by cap screws (Fig. 8).

BRAKE PEDAL REMOVAL

"Ambassador" and "Statesman" Series

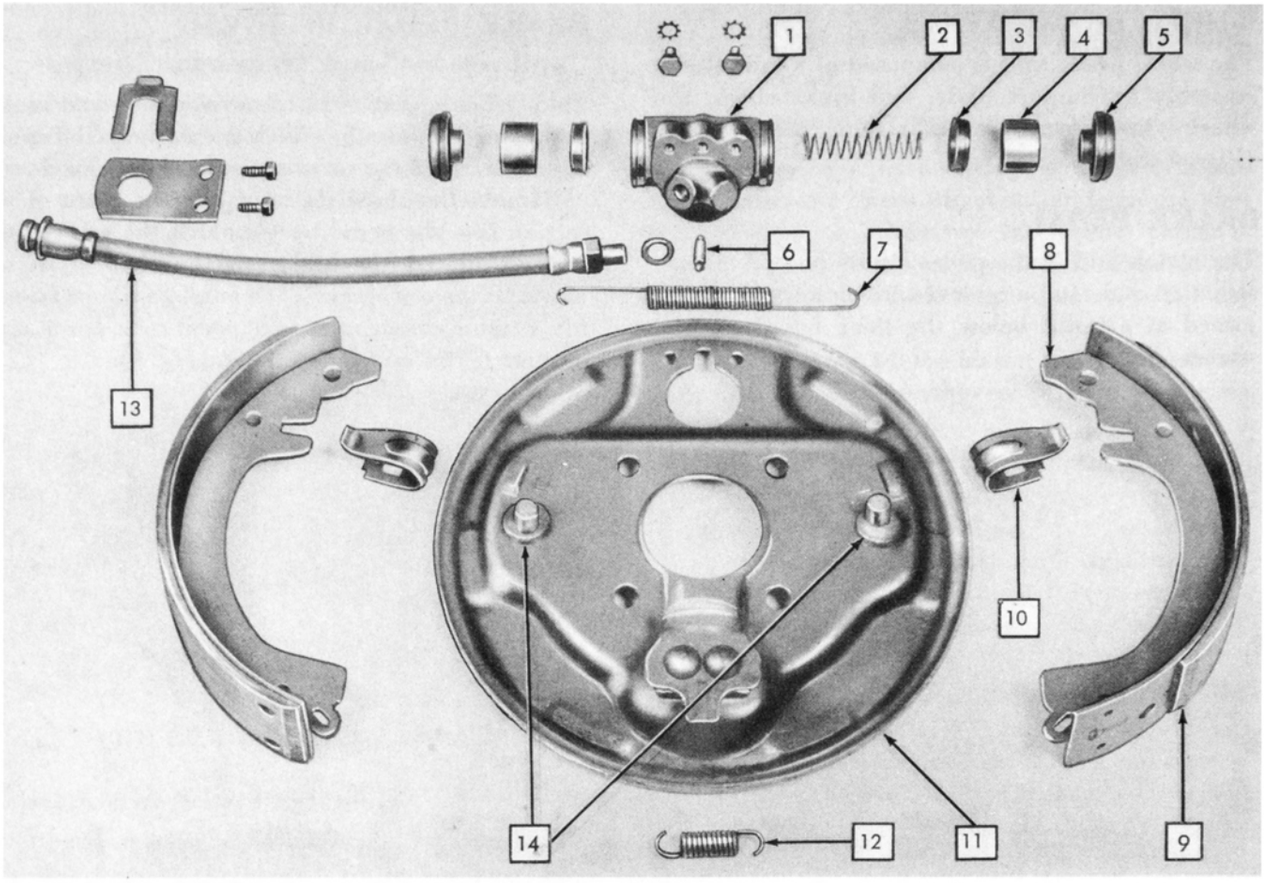
Fold the floor mat away from the clutch and brake pedal rod. Remove the clutch and brake pedal opening cover. Slide the cover up on both pedal rods.

Remove the clutch pedal rod at the point of insertion into the pedal by loosening the cap screw; slightly depress the brake pedal rod to allow removal of the cap screw. The complete upper assembly, namely clutch and brake pedal rods, cover, and grommets can now be removed (Fig. 9).



1. Link
2. Rubber Boot
3. Piston
4. Rubber Cup
5. Compression Spring
6. Wheel Cylinder
7. Washer
8. Anchor Pin
9. Shoe Guide Plate
10. Brake Support Plate
11. Brake Shoe Return Spring
12. Shoe and Lining
13. Spring—Shoe Hold Down
14. Spring Pin—Shoe Hold Down
15. Cover, Adjusting Hole
16. Anchor Spring
17. Screw, Brake Shoe Adjusting

FIGURE 6—*Front Brake Assembly ("Ambassador" Series).*



1. Wheel Cylinder
2. Compression Spring
3. Rubber Cup
4. Piston
5. Rubber Boot
6. Bleeder Connection
7. Shoe Return Spring
8. Brake Shoe
9. Brake Lining
10. Flat Pressure Spring
11. Brake Shoe Support Plate
12. Anchor Spring
13. Flexible Hose
14. Eccentric Pins

FIGURE 7—*Front Brake Assembly ("Statesman" Series Shown).*

The balance of the clutch and brake pedal assembly is removed from below the car.

Disconnect the clutch pedal to beam rod, and the master cylinder piston push rod, and the return spring.

Remove the bolt and retaining clip from the pedal shaft. The shaft and pedals can then be removed from the master cylinder support.

"Rambler" Series

The clutch and brake pedal rods are disconnected from the pedals underneath the toe-board.

Disconnect the clutch pedal to beam rod, and the master cylinder piston push rod, and the return spring.

Remove the bolt and retaining clip from the pedal shaft. The shaft and pedals can then be removed from the bracket.

BRAKE ADJUSTMENTS

"Ambassador" Series

The "Ambassador" Series brake is of the Bendix Servo type requiring both major and minor adjustments.

Minor brake adjustment for this Series should be made in the following prescribed steps:

Support the car clear of the floor in a safe manner. The parking brake lever must be in a full released position.

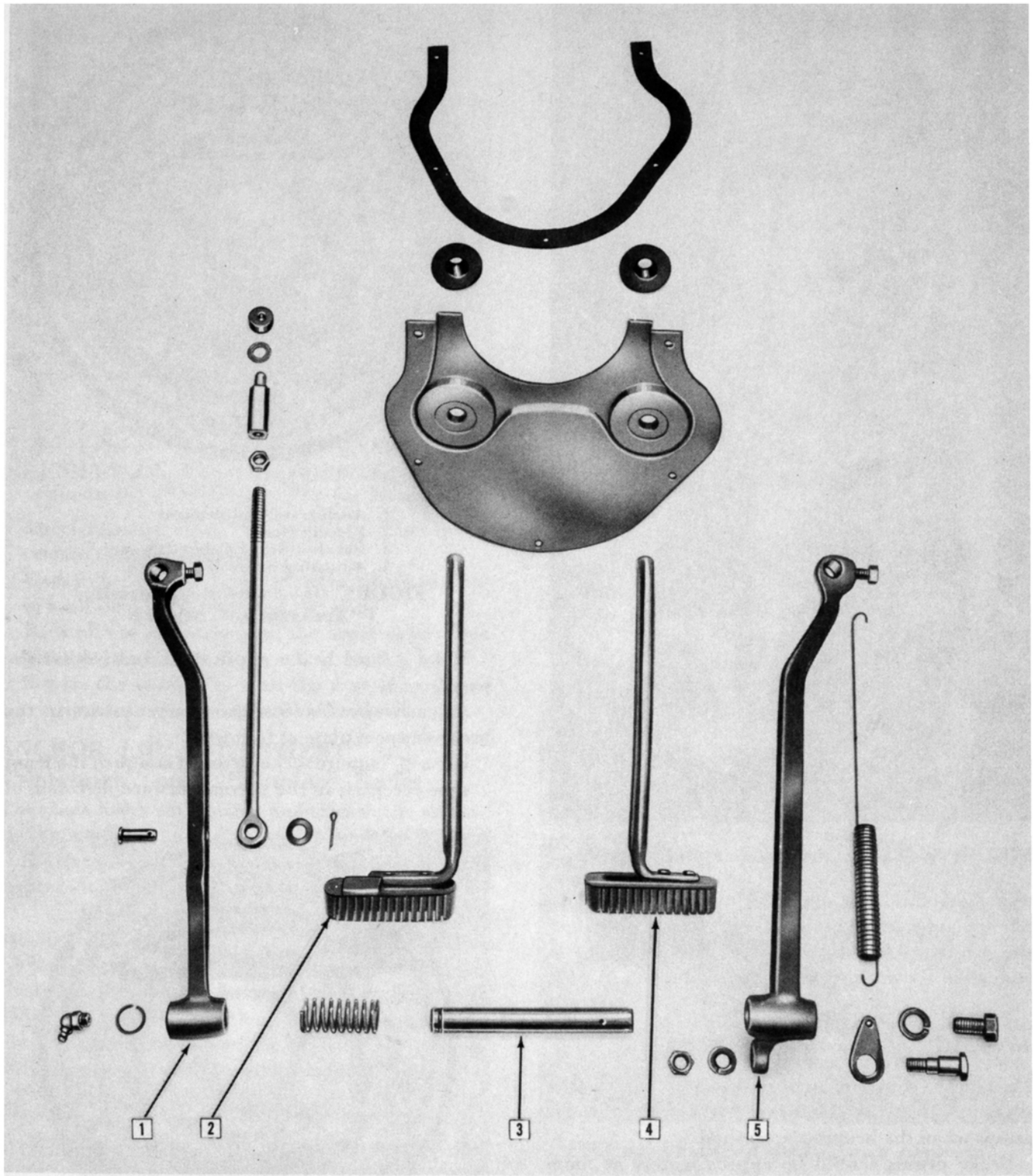
Adjust pedal play ¼" to ½" (See Brake Pedal Adjustment).

Check tightness of anchor bolts.

Remove adjusting screw dust cover. Spread the brake shoes by rotating the star-wheel until the drums can just be turned by hand. Then back off the adjusting screw approximately 14 notches. Do this on all four wheels. If the drums do not turn freely, reset the anchor bolts as outlined under "Major Adjustment."

Reinstall adjusting hole covers in the support plates and lower the car to the floor and road test.

Major adjustment of the "Ambassador" Series brakes is required when shoes are relined or replaced, or if minor adjustment fails to give satisfactory operation of the brake system. Follow the procedure used in minor adjustment with the addition of the anchor pin adjustment described below.



1. Clutch Pedal
2. Clutch Pedal Rod
3. Clutch and Brake Pedal Shaft
4. Brake Pedal Rod
5. Brake Pedal

FIGURE 8—*Clutch and Brake Pedal Assembly ("Ambassador" and "Statesman" Series).*

Insert .015" feeler gauge between the secondary shoe lining and the drum, and check clearance at each end of the secondary shoe. A clearance of .015" at each end of the secondary shoe, with the primary shoe against the opposite side of the drum, indicates good anchor and adjusting screw positioning. If a .015" clearance at both ends of the secondary shoe cannot be obtained by rotating the adjusting screw, the anchor pin must be adjusted.

To adjust the anchor pin (bolt), loosen the lock nut, turn the adjusting screw (Fig. 11) until the shoes are against the drum, and tap the lock nut with a hammer upward toward the brake drum until the brake drum drags. Back off the adjusting screw

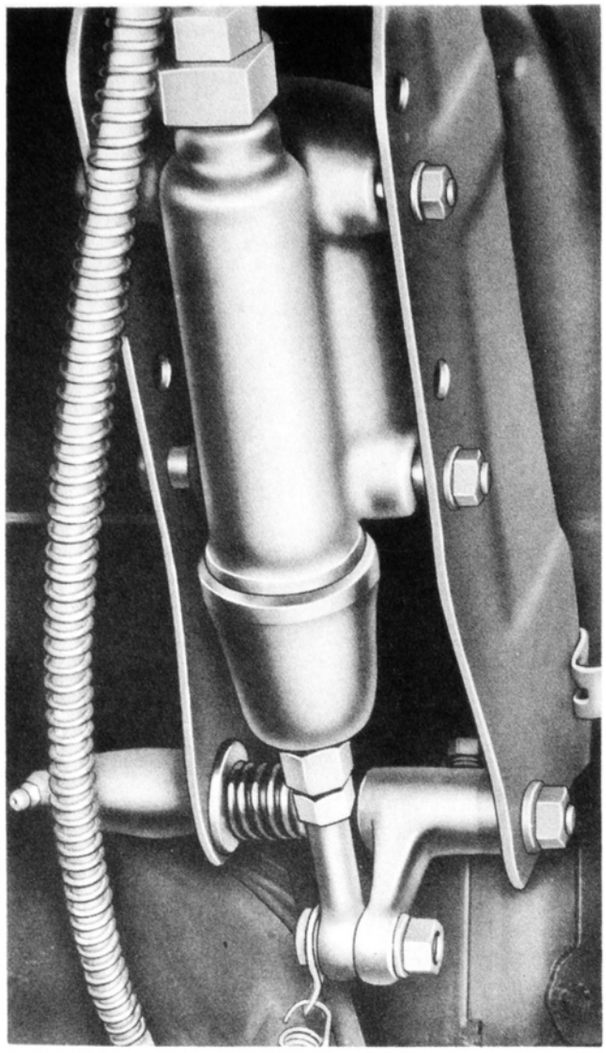


FIGURE 9—*Clutch and Brake Pedal Assembly.*

several notches, and insert feeler gauge (.015″) to get the necessary clearance. Tighten the lock nut and again check both shoes for .015″ clearance to be certain the anchor pin has not moved.

BRAKE ADJUSTMENTS

"Statesman" and "Rambler" Series

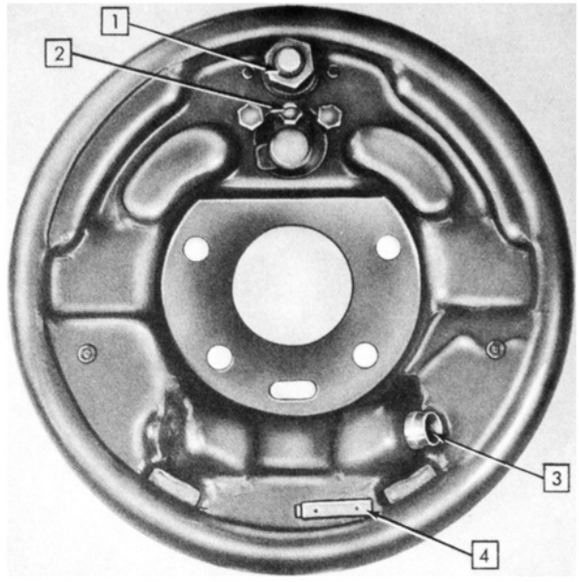
The floating shoe type brake eliminates major brake adjustments as the shoes center themselves in the drums when the brakes are applied.

Brake drums should be approximately at room temperature when making adjustments. If brakes are adjusted when drums are hot or expanded, the shoes may drag when the drums cool and contract.

To compensate for lining wear, the brakes are adjusted as outlined below:

Support the car clear of the floor in a safe manner. The parking brake lever must be in a full released position.

Adjust the brake pedal play to ¼″ to ½″ by adjusting length of master cylinder push rod (See Brake Pedal Adjustment).



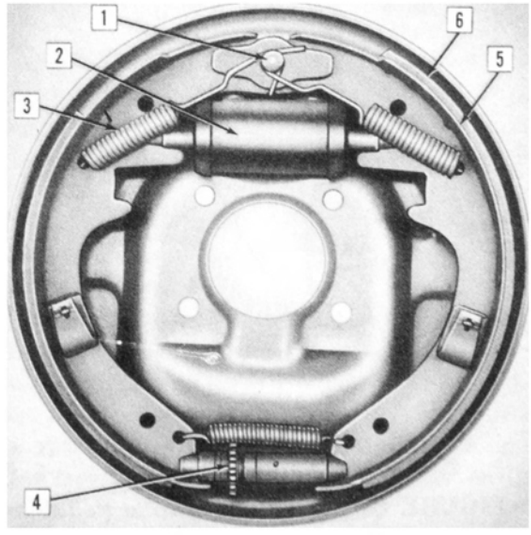
1. Anchor Bolt Adjustment
2. Bleeder Screw
3. Parking Brake Cable Entrance
4. Adjusting Screw Dust Cover

FIGURE 10—*Adjustment Location ("Ambassador" Series).*

Make a hard brake application and release the pedal.

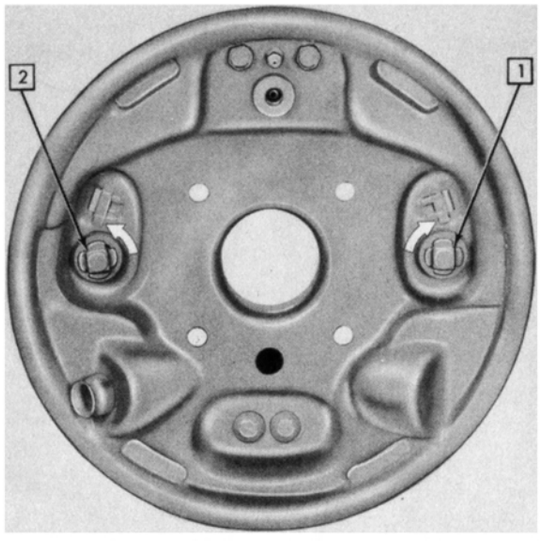
At each wheel, adjust the two eccentrics in the brake support plate as follows:

Use a ⅜″ square socket wrench and turn the front shoe eccentric in the normal forward direction of



1. Anchor Bolt (Major Adjustment)
2. Wheel Cylinder
3. Return Spring
4. Star-Wheel Shoe Spreader
5. Brake Shoe
6. Brake Shoe Linings

FIGURE 11—*Brake Assembly ("Ambassador" Series).*



1. Clockwise, View From Back
2. Counter-Clockwise, View From Back

FIGURE 12—*Eccentrics For Brake Shoe Adjustment ("Statesman" Series Shown).*

wheel rotation (Fig. 12) until the entire lining surface contacts the drum.

With a slight brake drag, rotate the wheel slightly in both directions centering the shoe.

Back off the eccentric until the drum is just free without touching.

Repeat the procedure with the rear shoe eccentric, turning it in the opposite direction.

ANCHOR LIP ADJUSTMENT
"Statesman" and "Rambler" Series

The short lower coil spring, underneath the anchor lip, must retain the brake shoes in constant contact with the brake support plate with sufficient tension to prevent side movement of the brake shoes (Fig. 13). This is accomplished by bending the anchor lip slightly toward the brake support plate so that 15 lbs. pressure is exerted by the coil spring to retain the shoes on the ledges of the support plate. This can be measured with a spring scale hooked to the end of the shoe. Note the pressure required to pull the shoe outward from the support plate.

BRAKE PEDAL ADJUSTMENT

There should be ¼" to ½" free movement of the brake pedal before master cylinder piston travel begins. Without this there is danger of the compensating port being covered, destroying the compensating feature of the system and also causing the brakes to drag.

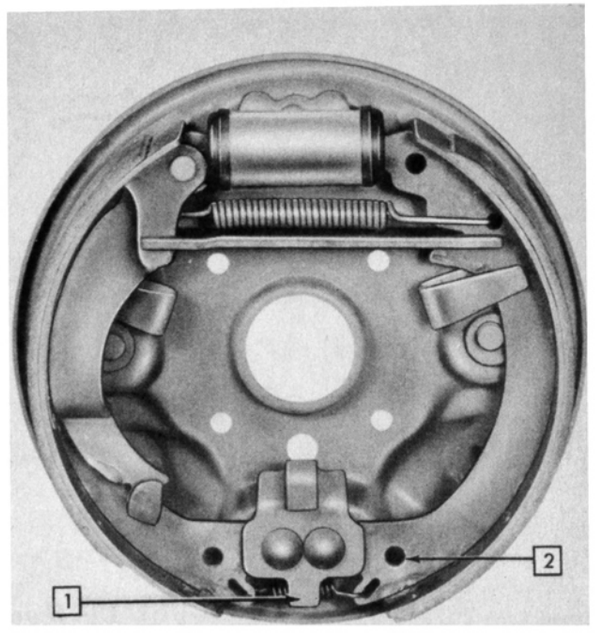
The brake pedal adjustment is accomplished by means of the threads and lock nuts on the master cylinder piston push rod (Fig. 2).

PARKING BRAKE

The parking brake applies the rear brake shoes by means of cables connected between the hand lever and the rear brake support plates. The hand brake lever of the "Ambassador" and "Statesman" is located to the right of the steering jacket tube, just below the instrument panel.

The "Rambler" Series hand brake lever is located on the extreme lower left side.

The parking brake is most easily applied by depressing the foot brake pedal to its full travel and simultaneously pulling out ("Ambassador" and "Statesman") or up ("Rambler") on the hand brake lever.



1. Bend Here Toward Support Plate
2. Attach Spring Scale Here and Read Pressure. It Should be 15 lbs.

FIGURE 13—*Anchor Lip Adjustment.*

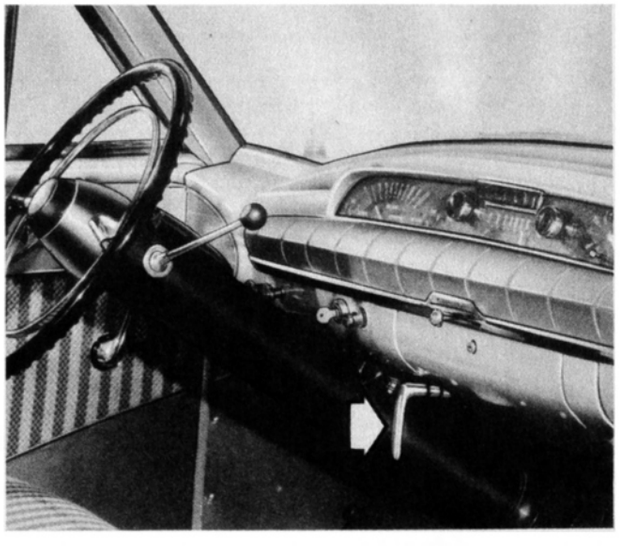
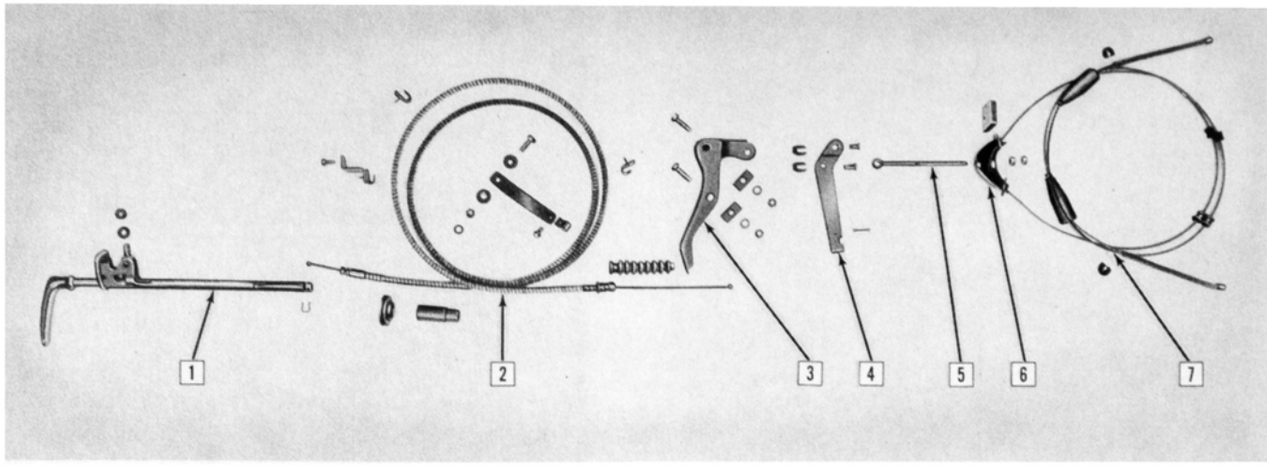


FIGURE 14—*Hand Brake Lever Location.*



1. Hand Brake Lever Assembly
2. Hand Brake Cable
3. Bell Crank Bracket
4. Bell Crank
5. Adjusting Rod
6. Hand Brake Cable Equalizer
7. Rear Brake Cable

FIGURE 15—*Hand Brake Lever Assembly ("Ambassador" and "Statesman" Series).*

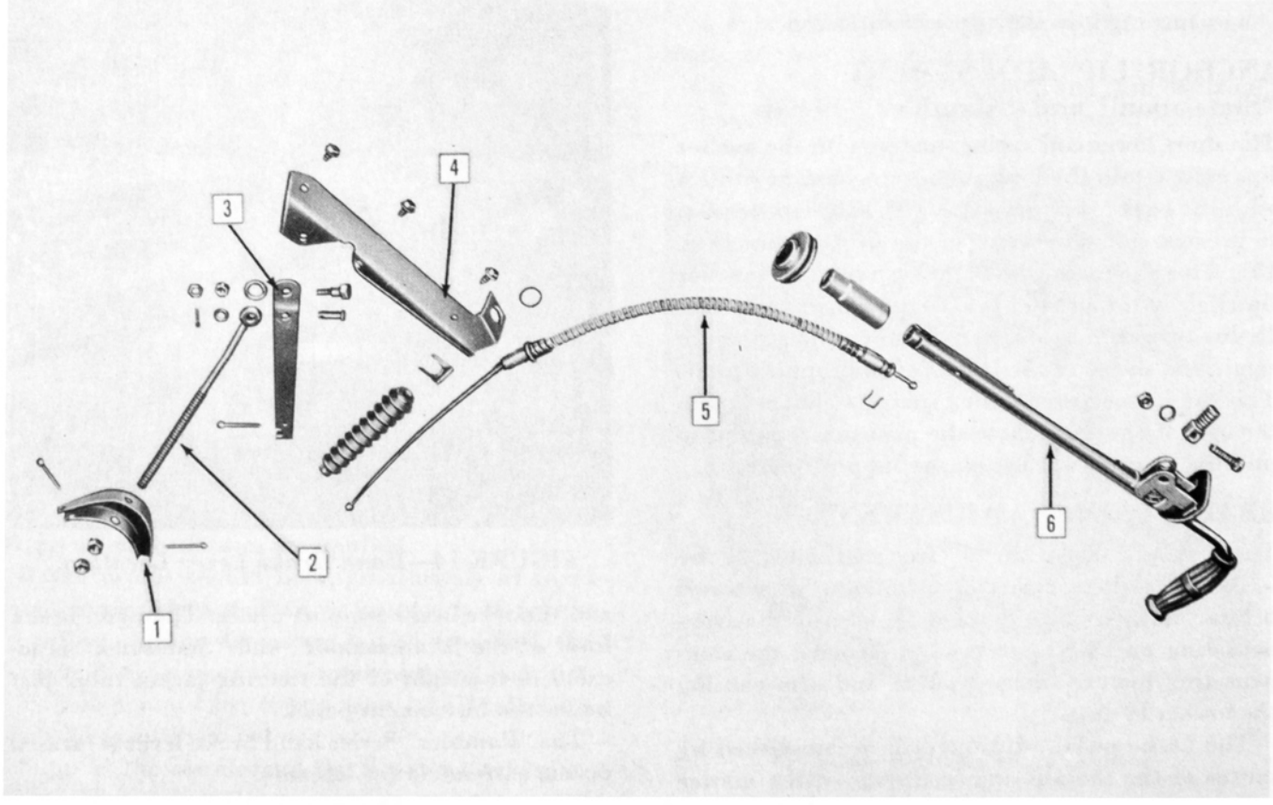
The principal parts of the hand brake assemblies are shown in Figures 15 and 16.

PARKING BRAKE ADJUSTMENT

The parking brake should be adjusted in the following manner:

Withdraw the hand brake lever to the rear to provide a 3½" clearance between the hand brake lever handle and bracket as shown in Figure 18.

With the lever in this position, tighten the hand brake cable at the equalizer to a point where



1. Hand Brake Cable Equalizer
2. Adjusting Rod
3. Bell Crank
4. Bell Crank Bracket
5. Hand Brake Cable
6. Hand Brake Lever Assembly

FIGURE 16—*Hand Brake Lever Assembly ("Rambler" Series).*

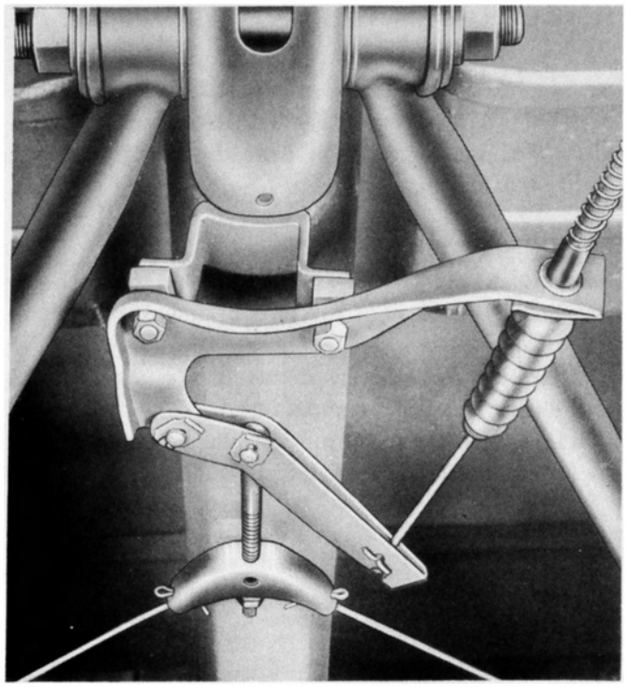


FIGURE 17—*Hand Brake Bell Crank ("Ambassador" and "Statesman" Series Shown).*

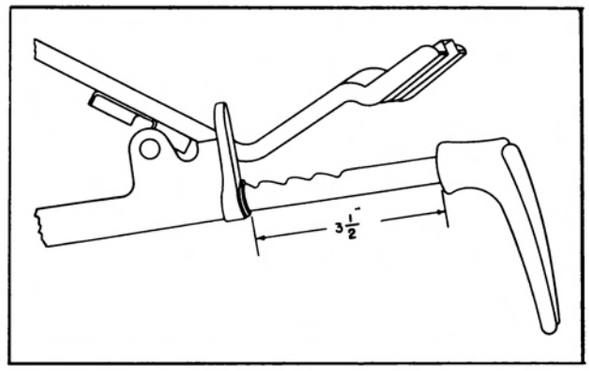


FIGURE 18—*Hand Brake Lever Adjustment ("Ambassador" and "Statesman" Series Shown).*

the rear brakes are fully applied. This will prevent possible brake drag.

To release the parking brake, apply brake pedal pressure, turn the parking brake handle counterclockwise 70°, and push it into the released position.

BRAKE SPECIFICATIONS

Series	"Ambassador"	"Statesman"	"Rambler"
Type of Mechanism	Lockheed Hydraulic	Lockheed Hydraulic	Lockheed Hydraulic
Make	Bendix Servo	Bendix Floating Shoe	Bendix Floating Shoe
Total Foot Braking Area	171 Sq. Inch	132 Sq. Inch	92 Sq. Inch
Lining Size—Width x Length			
Primary—Front	2" x 9"	2" x 9⅞"	1¾" x 8"
Rear	2" x 9"	2" x 9⅞"	1¼" x 8"
Secondary—Front	2½" x 11 3/32"	1¾" x 7⅝"	1½" x 8"
Rear	2" x 11 3/32"	1¾" x 7⅝"	1" x 8"
Clearance, Toe, Inches	.015"	Eccentric Adj.	Eccentric Adj.
Clearance, Heel, Inches	.015"	Eccentric Adj.	Eccentric Adj.
Pedal Free Play	¼" to ½"	¼" to ½"	¼" to ½"
Drum Diameter, Inches	10"	9"	8"
Wheel Cylinder	Straight Bore	Straight Bore	Straight Bore
Front Cylinder Bore, Diameter	1 1/16"	1"	1"
Rear Cylinder Bore, Diameter	15/16"	⅞"	13/16"
Master Cylinder Bore, Inches	1⅛"	1"	1"
Piston Clearance, Wheel and Master Cylinder, Inches	.001" to .003"	.001" to .003"	.001" to .003"

WHEELS AND TIRES

Series	"Ambassador"	"Statesman"	"Rambler"
Wheel Size	15″	15″	15″
Tire Size			6.40 x 15″ (Custom Series)
Standard	7.10 x 15″	6.70 x 15″	5.90 x 15″ (Super and Deluxe Series)
Tire Pressure Cold Front and Rear Wheels	24 lbs.	24 lbs.	24 lbs.

INFLATION PRESSURES

One of the most important factors in tire care is to maintain proper inflation. Recommended pressure for normal service is 24 lbs. for all Series.

In order to maintain the correct inflation pressure, tires should be checked when cold.

The effect of three types of inflation pressures are shown in Figure 19.

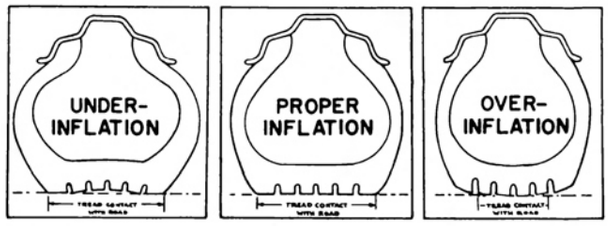


FIGURE 19—*Effect of Inflation Pressures.*

The inflation pressure recommended by the tire manufacturer is the best pressure to use in order to maintain efficient balance, riding comfort, tire life, and smooth steering.

Whenever the air pressure is either greater or less than recommended, the balance of forces in the tire is upset. Results are: abnormal wear and premature failure.

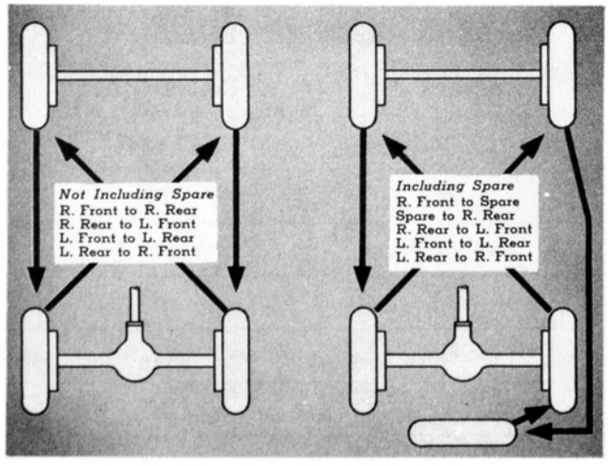


FIGURE 20—*Tire Rotation.*

ROTATION OF TIRES

To equalize tire wear, it is recommended that the tires be interchanged after the first 2,500 miles. Then at 6,000 miles and every 5,000 miles of service thereafter. Follow the rotation procedure as illustrated in Figure 20.

WHEEL BALANCE

Tire and wheel balance is very important both for preventing excessive tire wear and for ease in handling the car.

There are four factors involved in wheel balance and each one must be considered.

Radial run-out is the unevenness of tread caused by an eccentric wheel or tire (Fig. 21).

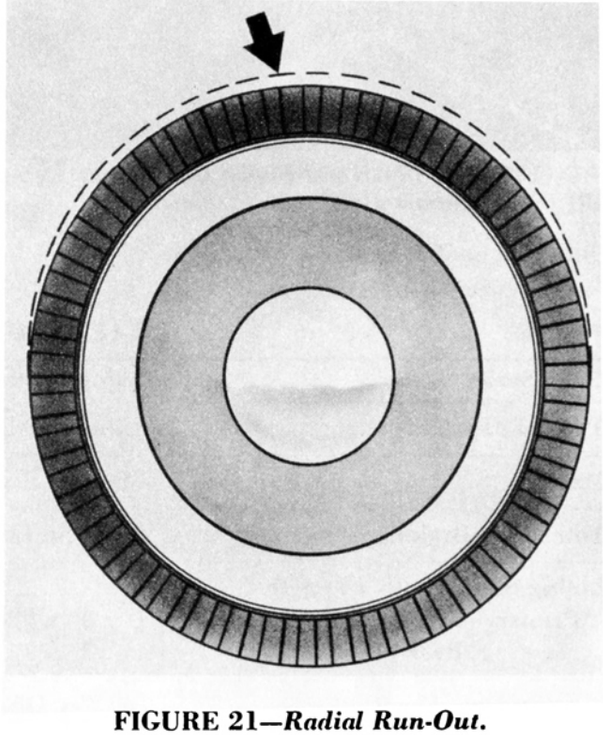


FIGURE 21—*Radial Run-Out.*

To correctly inspect a wheel for excessive run-out, the wheel should be mounted by means of the mounting lug either on a hub or an off-the-car type balancer.

The radial run-out is checked at the tire bead seat (Fig. 22) not the outer rim of the wheel. This run-out should not exceed .062″ or $\frac{1}{16}$″ of an inch.

To check whether the run-out is in the wheel or the hub, mark the high spot on both the wheel and hub with a "+" sign, then mark the low spot on the wheel and hub with a "—" sign. By placing the high spot "+" mark 180° from its former position and rechecking the run-out, the run-out high limit should be at the same "+" mark on the wheel. If the high limit is at the "+" mark on the hub, then the hub has the run-out.

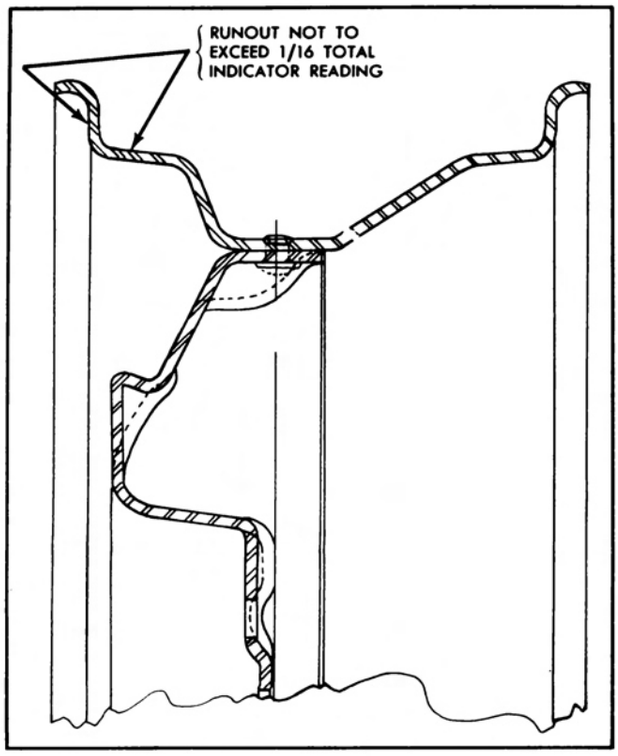


FIGURE 22—*Check Wheel For Run-Out.*

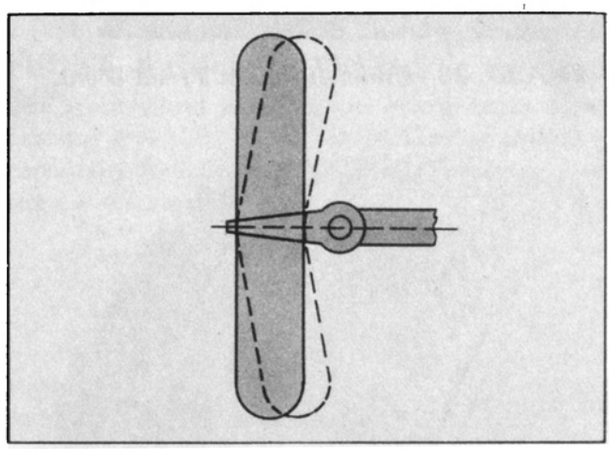


FIGURE 23—*Lateral Run-Out.*

Lateral Run-Out is the side movement of the wheel caused by a bent hub or wheel (Fig. 23).

Lateral run-out can be checked in the same manner as radial run-out. However, the reading is taken at the inner vertical bead flange (Fig. 22).

Static unbalance is an unequal distribution of weight around the center of rotation (Fig. 24).

Dynamic unbalance is an unequal distribution of weight around the vertical center line of the wheel (Fig. 25).

TIRE WEAR

Various types of abnormal tire wear and their causes are described in the following paragraphs.

A tire severely cupped as indicated in Figure 26 is mainly due to mechanical irregularities in the car such as loose steering connections, loose wheel bearings, or any excessive looseness throughout the front suspension.

An uneven brake adjustment, out-of round brake drums or a tire which is statically unbalanced, may also cause rapid and uneven tire wear of this type.

Figure 27 represents a tire which is worn only on one side of the tread. This indicates excessive positive or negative camber.

The extent of camber wear is largely due to the amount of camber angle in relation to the type or shape of the local road surfaces.

Tread wear very similar in appearance to this type may also be caused by driving at high speeds on turns. This is known as "Cornering" tread wear and cannot be corrected by changing the camber angle.

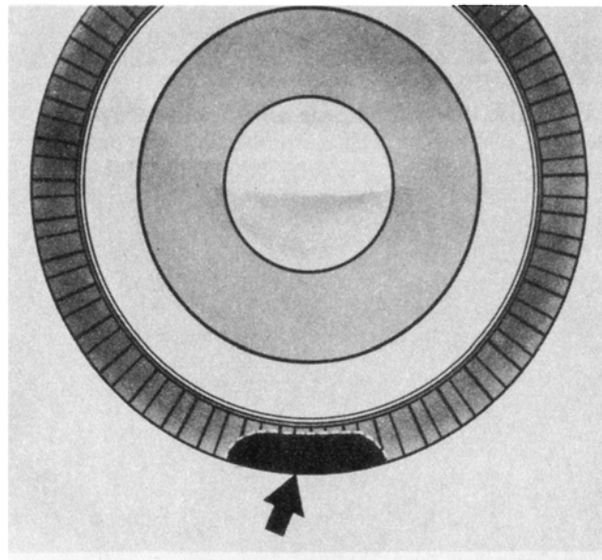


FIGURE 24—*Static Unbalance—When Wheel Weight is Not Evenly Distributed Around the Hub as a Center, the Heavy Point Goes to the Bottom.*

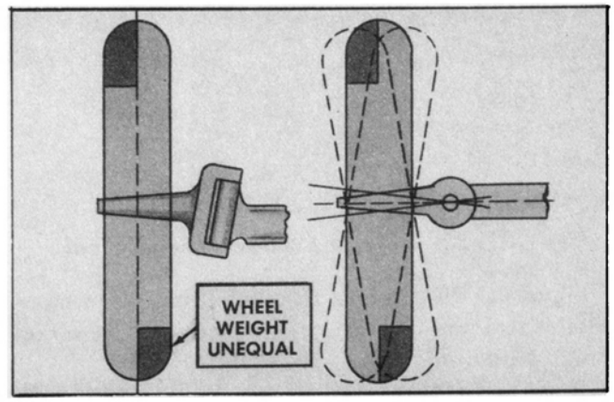


FIGURE 25—*Dynamic Unbalance—When Wheel Weight is Not Evenly Distributed Around the Plane of Rotation, High Speeds Result in Wheel Wobble.*

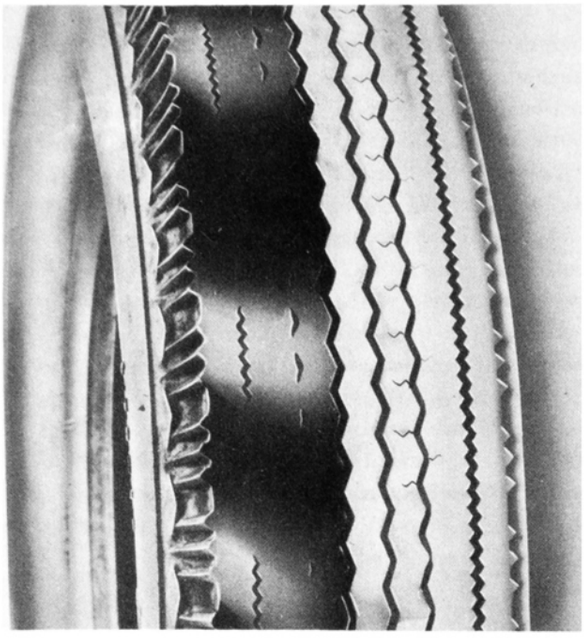


FIGURE 26—*Flat Spots and Severe Cupping.*

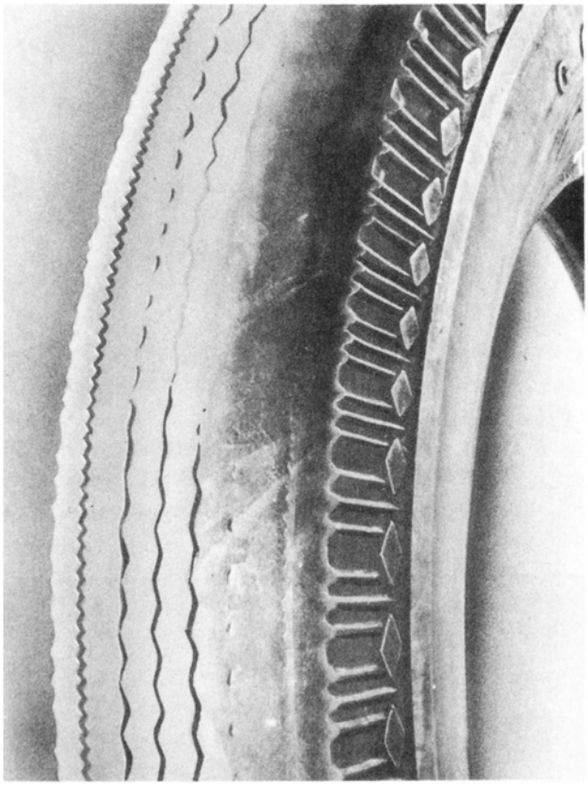


FIGURE 27—*Side or Camber Tread Wear.*

Figure 28 illustrates a tire which has worn more on the two sides than in the center as a result of Under-Inflation.

When a tire is driven under this condition the side walls and the two outer treads carry most of the load. As shown in Figure 19, the center treads compress and as a result, the outer treads will wear faster than the center treads.

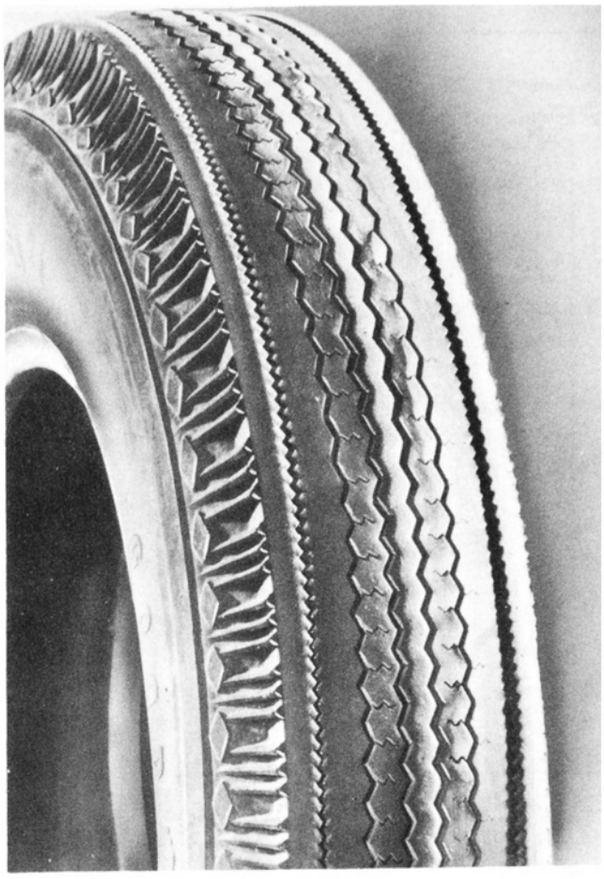


FIGURE 28—*Under-Inflation Tread Wear.*



FIGURE 29—*Toe-In or Toe-Out Wear.*

Also indicated in Figure 19 is a tire which has been continually driven Over-Inflated; as a result the center treads will wear more rapidly than the outer treads. This is caused by the center treads carrying most of the load.

Figure 29 illustrates a tire which has worn prematurely as a result of toe-in or toe-out misalignment.

One edge of the tire tread is worn to a "feathered edge." This is noticed by a rounded off edge on one side and sharpness on the other. This actually means that the tire is slipping sideways or scuffing as it travels down the road.

If the "feathered edge" is on the inner sides of the tread, either on one or both tires, it indicates that one or both tires have excessive toe-in; while the same condition on the outer sides of the treads indicate excessive toe-out.

In some instances, one front tire may indicate toe-in wear, while the opposite tire indicates toe-out wear. When this condition is encountered, the steering geometry must be checked and set to specifications.

This condition can also be caused by bent steering arms, with the result that the inside wheel on both turns, either toes-in or toes-out in excess.

FRONT WHEEL BEARINGS

The front wheel bearings are of the taper roller bearing type. The front wheel bearing assembly consists of the inner and outer roller bearings, their cups, and a grease seal (Fig. 30).

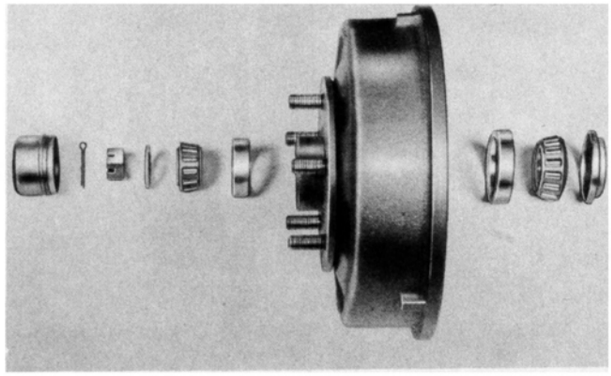


FIGURE 30—*Front Wheel Bearing Assembly ("Statesman" Series Shown).*

Before adjusting the front wheel bearings, clean and inspect all parts. Replace any questionable parts. Clean the brake support plate of all lubricant.

Pack the bearings with a good recommended bearing grease, then mount the wheel on the wheel spindle. To adjust the wheel bearings, rotate the wheel while tightening the wheel spindle nut. Tighten the nut until it is firmly seated and will cause a drag on the wheel. Back off on the adjusting nut to the first castellation or until the cotter pin hole is aligned. The wheel should now be free to rotate but without play in the hub and bearings.

Install a new cotter pin and lock it to the nut and spindle. Install the inner and outer hub caps.

REAR WHEEL BEARINGS

The rear wheel hub centers are tapered to fit the taper on the end of the axle shaft. The keyway in the hub matches the keyway in the shaft.

The rear wheel bearings have no further provision for lubrication after assembly. Therefore, these bearings should be packed with a good quality wheel bearing lubricant before the reassembly operation.

REMOVING REAR WHEEL BEARINGS

When pulling the rear wheel hub and drum assembly, use puller J-1644-B which exerts a pushing force on the axle shaft and a pulling force on the hub assembly (Fig. 31).

Remove the brake support plate assembly. Do not damage the shims. "Mike" the shims as they are

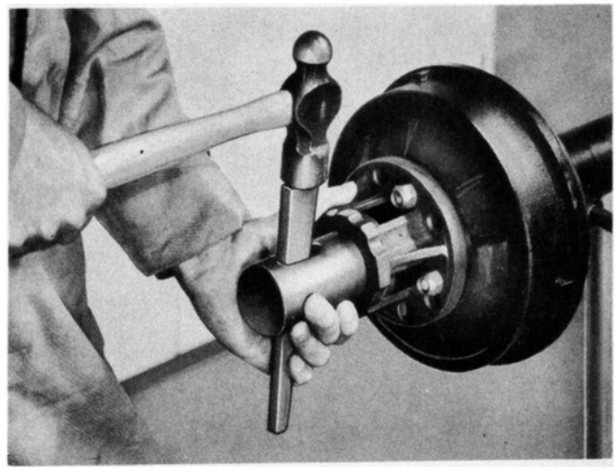


FIGURE 31—*Rear Wheel Hub Puller (J-1644-B).*

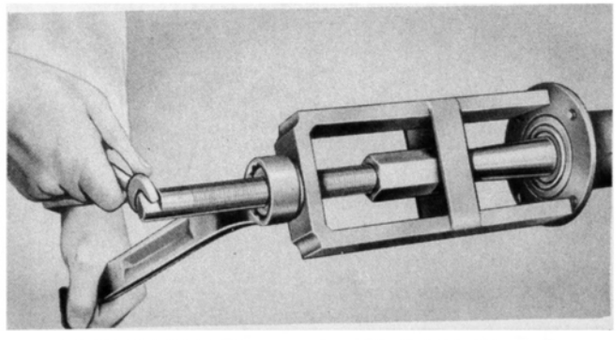


FIGURE 32—*Removing Axle Shaft and Bearing From Axle Housing.*

removed so that the same amount of shims are reinstalled.

Pull the axle shaft, (Use Tool J-2498-A) bearing, and bearing cup. Slip the cup off the shaft (Fig. 32).

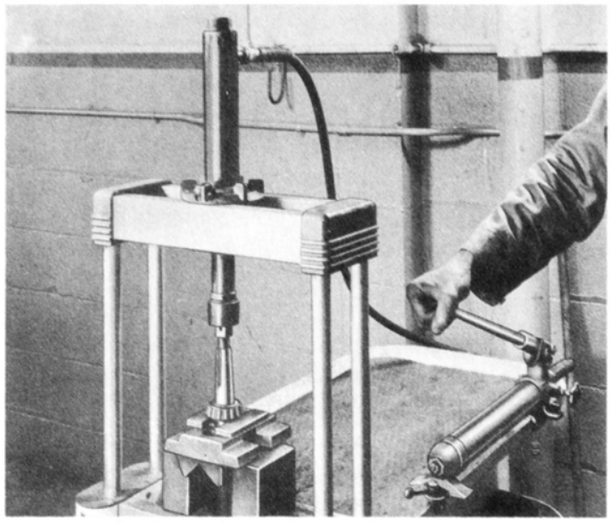


FIGURE 33—*An Arbor Press Like This Should be Used to Remove Wheel Bearings From Axle Shafts.*

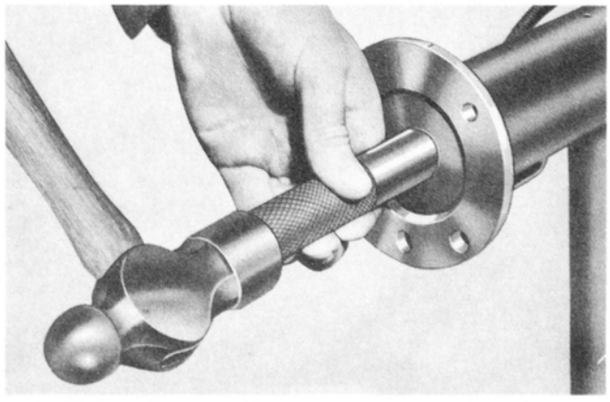


FIGURE 34—*New Oil Seals Should Always be Installed When Axles Are Reassembled.*

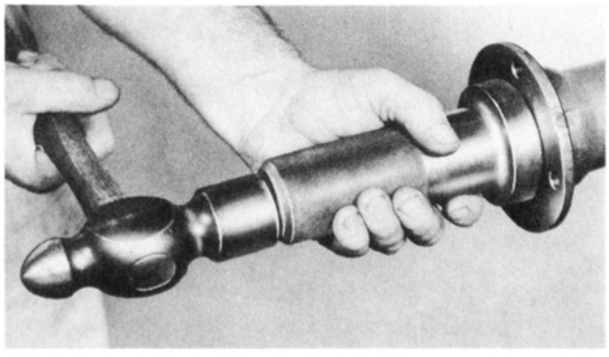
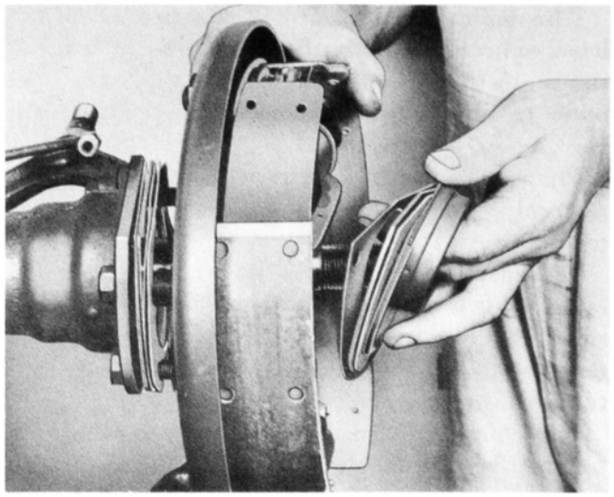
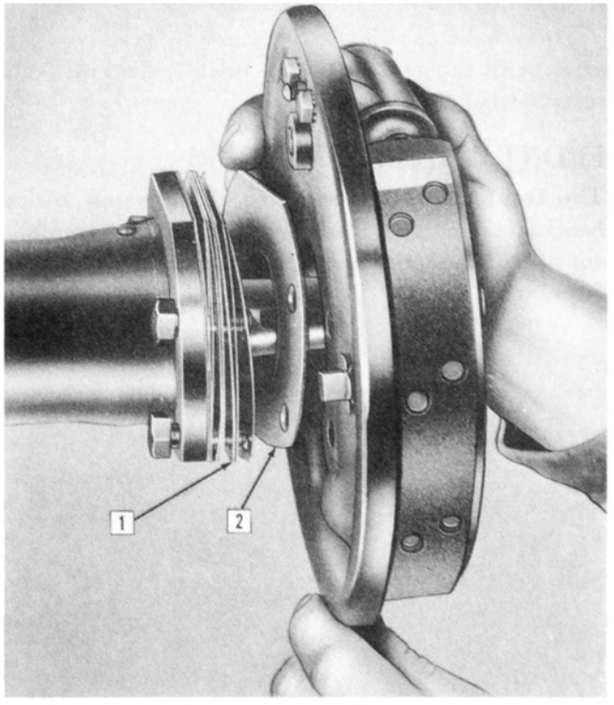


FIGURE 35—*The Outer Axle Shaft Bearing Cup is Driven Into Place With Tool J-1433-1.*



1. Support Plate
2. Shims
3. Oil Seal

FIGURE 36—*Installing Brake Support Plate Assembly and Outer Oil Seal ("Ambassador" Series Shown).*



1. Shims
2. Oil Seal

FIGURE 37—*Installing Brake Support Plate Assembly ("Rambler" Series).*

The bearing cone and roller assembly is a tight press fit on the axle shaft and must be removed in an arbor press (Fig. 33).

REAR WHEEL BEARINGS—INSTALLATION

Before installing the axle shaft in the housing, install new oil seals (Fig. 34).

NOTE: *The "Ambassador" Series right hand axle shaft is 1½" longer than the left.*

Clean and pack wheel bearings thoroughly with quality wheel bearing lubricant and press the bearing on the axle shaft.

Install the axle shaft in the housing by sliding the splined end of the shaft into the differential side gear, matching the splines. Then install the bearing cup with tool J-1433-1 as in Figure 35.

Slide the original shims on the axle and install the brake support plate, spacer, and seal (Fig. 36).

Tighten the cap screws that hold the support plate to the axle housing flange. Then strike the end of each axle shaft with a lead hammer to drive the bearing cup on the opposite side solidly in place.

CAUTION: *When installing the shims, line up the drain holes in the shims with the drain hole in the flange.*

With the axle shafts and brake support plates installed and tightened, attach the axle shaft end play checking tool (J-2092) to the end of one shaft,

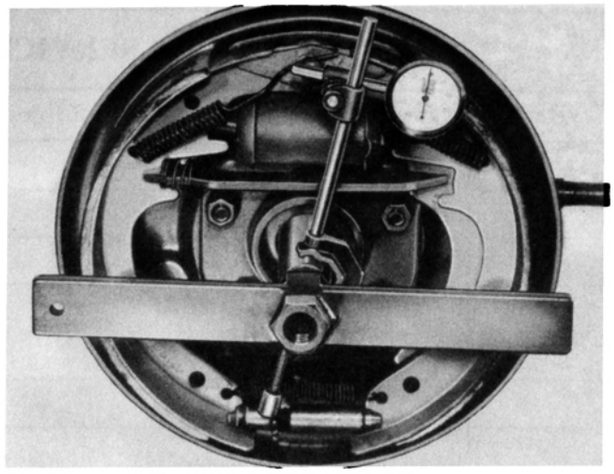


FIGURE 38—*Adjusting Rear Wheel Bearings ("Ambassador" Series Shown).*

and affix a dial indicator to the support plate or on the flat side of the checking tool. Now grasp the tool in both hands, pull it in and out, and read the end play on the dial. It should read .002" to .004" (Fig. 38).

TECHNICAL SERVICE LETTER REFERENCE

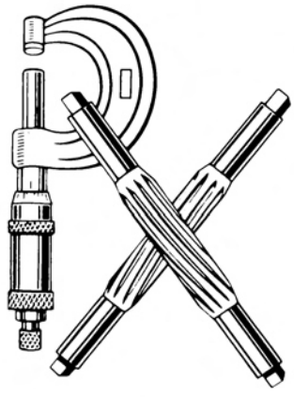
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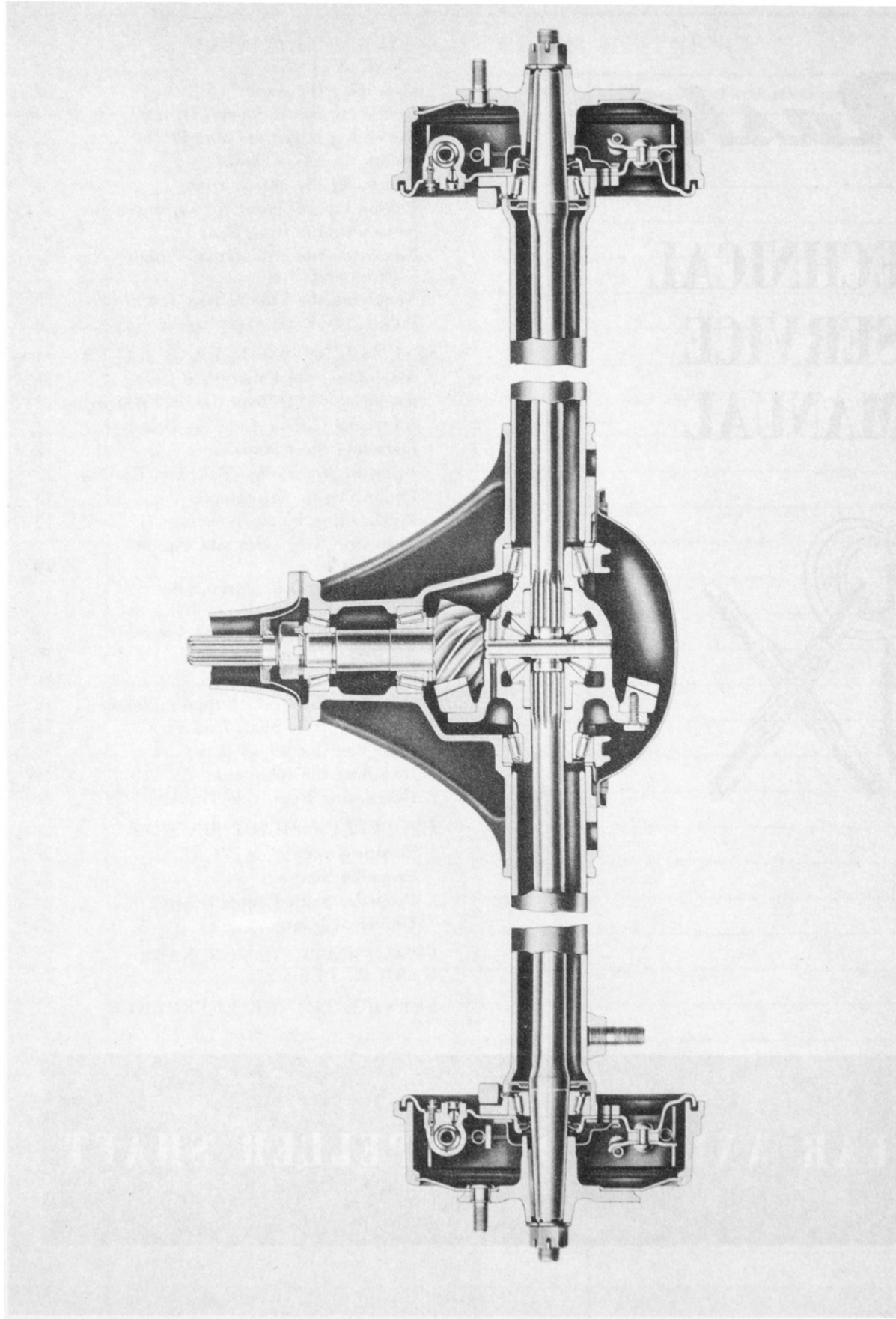
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REAR AXLE AND PROPELLER SHAFT



"Statesman" Series Rear Axle Assembly.

REAR AXLE AND PROPELLER SHAFT SECTION

DISASSEMBLING NASH REAR AXLES

Removing the Axle

Remove the plug at the bottom of the axle housing and allow the lubricant to drain from the axle.

An axle flushing solution can be used in the axle to degrease the parts before the actual disassembly is started. This practice will save time during disassembly as the parts will be free from lubricant and may be handled and inspected easily.

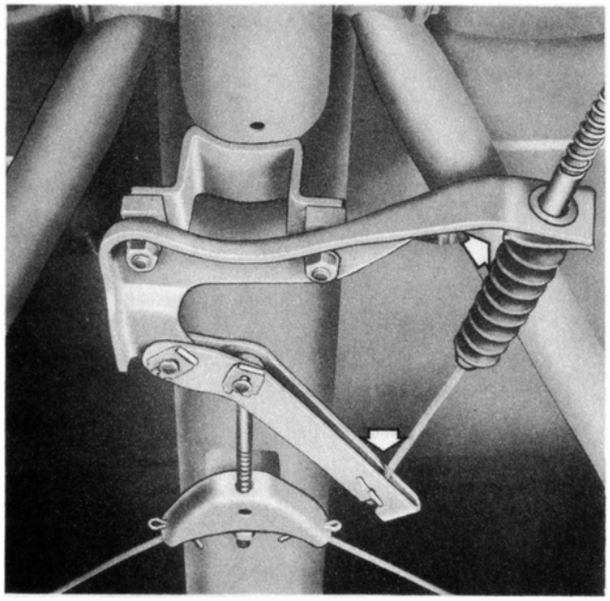


FIGURE 1—*Disconnect Hand Brake Cable at These Points.*

"Ambassador" and "Statesman" Series

Raise and support the rear of the body.

Disconnect the hand brake cable at the bell crank and the hand brake cable housing at the bracket (Fig. 1).

Then disconnect the torque tube from the transmission, the rear brake hose at the bracket on the body floor pan, the rear springs and shock absorbers from the axle tube, and the rear axle stabilizer bar at the axle tube (Fig. 2).

Roll the axle free from the car and disconnect the truss rods, torque tube, and propeller shaft from the rear axle. Figures 3 and 4, illustrate the method of attaching the propeller shaft to the rear axle.

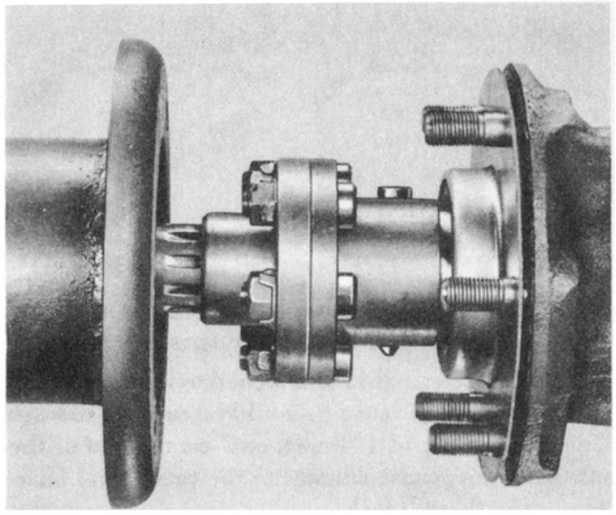


FIGURE 3—*Rear Axle and Propeller Shaft Companion Flange "Ambassador" Series.*

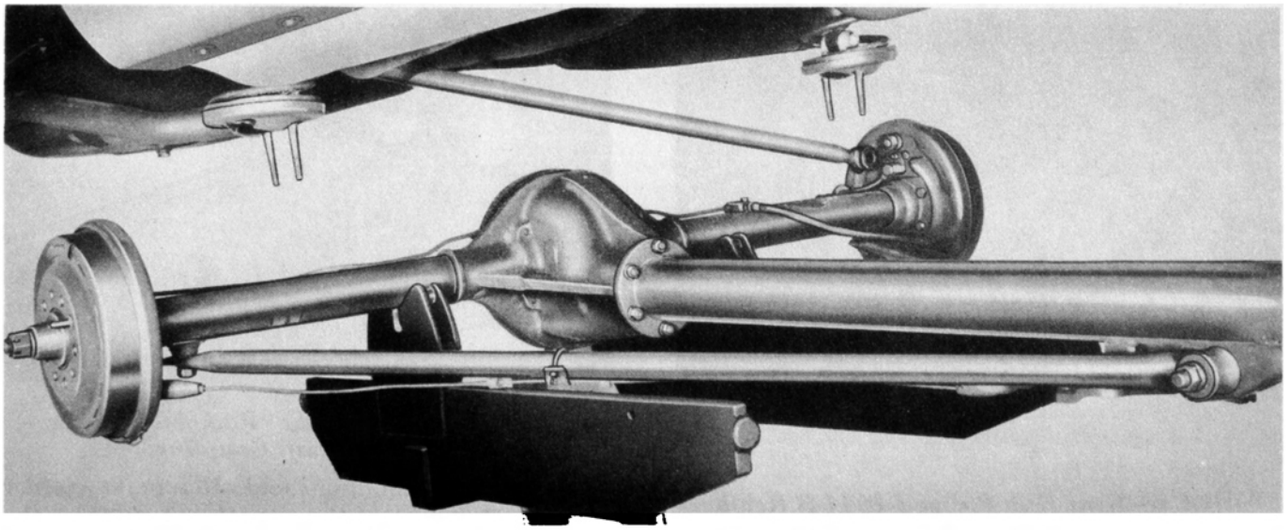


FIGURE 2—*Disconnecting the Rear Axle From the Body.*

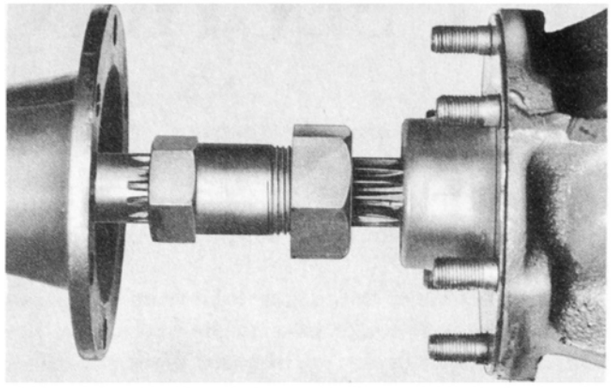


FIGURE 4—*Propeller Shaft Coupling "Statesman" Series.*

The rear axle may now be placed on suitable stands to facilitate overhauling (Fig. 5).

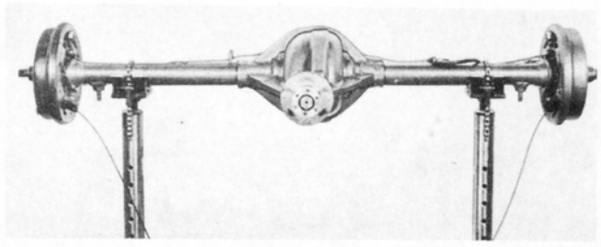


FIGURE 5—*Axle Installed on Stands to Facilitate Overhaul.*

Removing the Hubs and Drums

Rear Hub Puller J-1644-B attached to the rear wheel hub as shown in Figure 6 should be used to remove the hub. The use of a "knock-out" on the end of the axle shaft may cause damage to the rear wheel bearings or the thrust block.

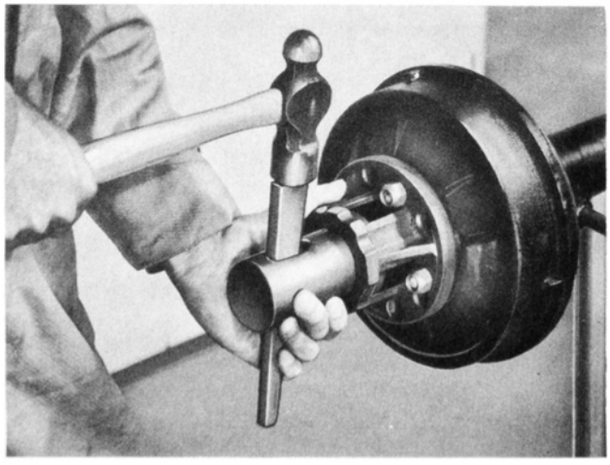


FIGURE 6—*Rear Hub Puller J-1644-B Removes Rear Wheel Hubs Without Damaging Internal Axle Parts.*

"Rambler" Series

Raise and support the rear of the body.

Remove the rear wheels and rear wheel hubs as outlined above.

Then disconnect and remove the hand brake cables from the brake assemblies.

Disconnect the rear shock absorbers, the rear brake line at the bracket on the body floor pan, and the rear springs from the body.

The axle, propeller shaft, and springs may be removed from the car as an assembly.

Remove the propeller shaft using Coupling Nut Wrenches J-4486 (Fig. 7 and 8).

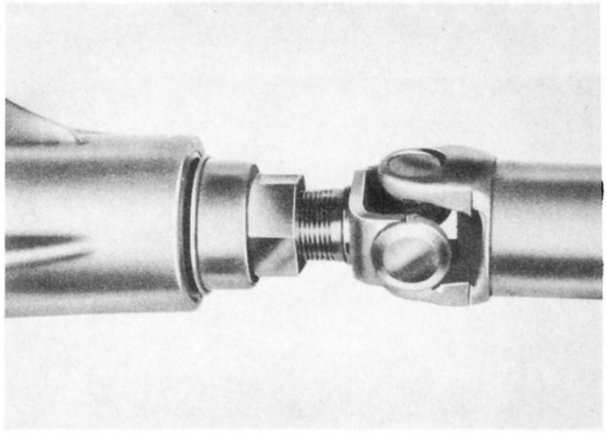


FIGURE 7—*Propeller Shaft Coupling "Rambler" Series.*

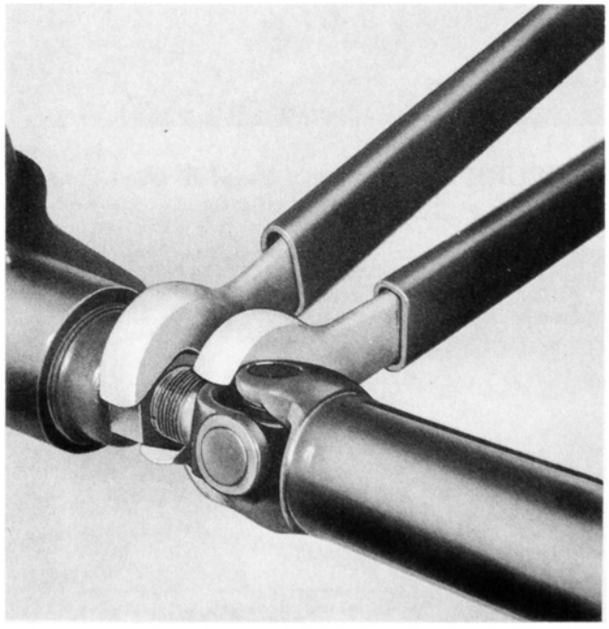


FIGURE 8—*Loosening "Rambler" Series Propeller Shaft Coupling.*

The coupling nut dust shield will serve as a puller to partially remove the propeller shaft from the rear axle pinion.

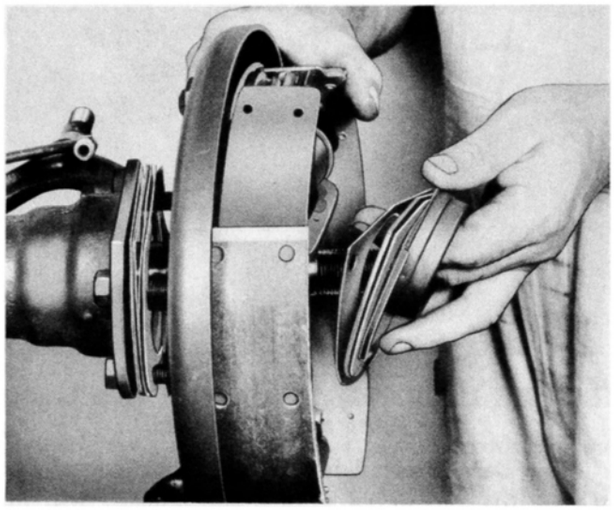
Then remove the rear springs to provide adequate room to work on the axle.

The axle may now be installed on suitable stands to facilitate overhaul.

REMOVING BRAKE SUPPORT PLATES

First Check the axle shaft end play using the End Play Checking Tool J-2092; note the end play. This practice will aid in setting the correct end play clearance at the time of reassembly.

Then remove the cap screws attaching the brake support plate to the axle tube. Slide the oil seal, support plate, and shims off the axle (Fig. 9).



1. Support Plate
2. Shims
3. Oil Seal

FIGURE 9—*Removing the Brake Support Plate "Ambassador" Series.*

The oil seal on the "Rambler" series is located between the support plate and the axle tube.

The shims should be measured using a micrometer to determine the amount that should be reinstalled at the time of assembly.

Inspect the brake support plate for elongated attaching bolt holes.

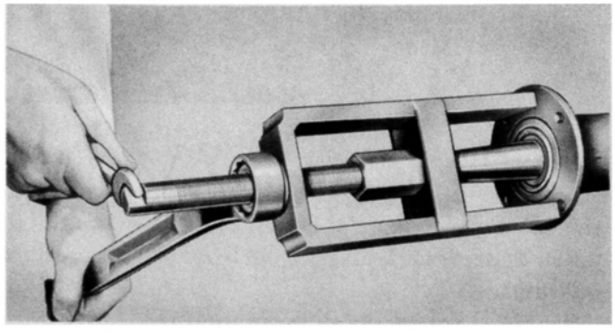


FIGURE 10—*Pulling the Axle Shaft with J-2498-A.*

PULLING THE AXLE SHAFTS

Attach the special axle shaft puller (J-2498-A) to the axle as shown in Figure 10, and pull the axle shaft out of the housing. Then slip the bearing cup off the shaft.

The bearing cone is a press fit on the axle shaft and must be removed using an arbor press (Fig. 11).

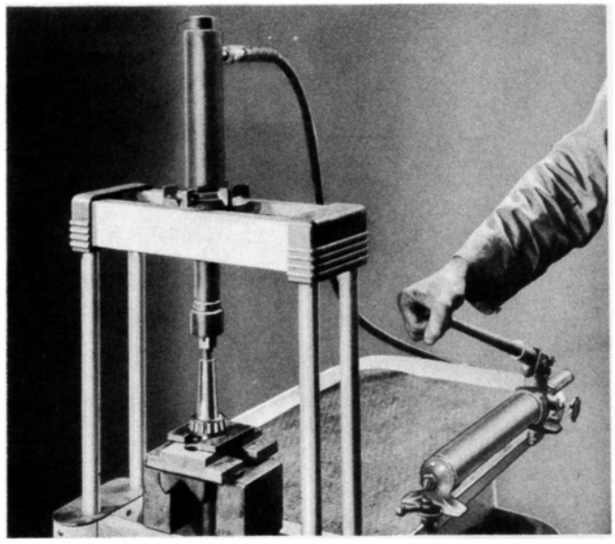


FIGURE 11—*Use an Arbor Press to Remove the Wheel Bearing From the Axle Shafts.*

Inspecting Axle Shafts

Install a differential side gear on the spline of the rear axle shaft and place the shaft between lathe or similar type centers.

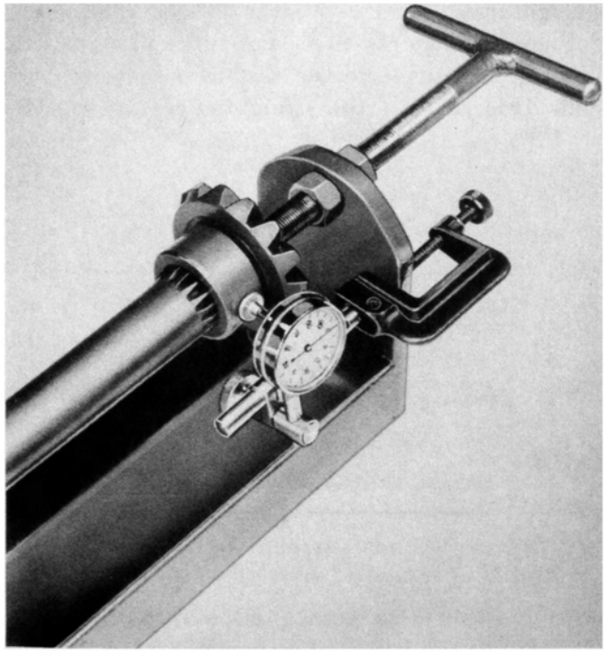


FIGURE 12—*Check the Axle Shaft Inner End for Run-Out.*

Use an accurate dial indicator and check the run-out at the center of the finished surface of the side gear hub. This run-out should not exceed a total of .007" (Fig. 12).

Then using the dial indicator, check the run-out at the machined surface adjacent to the bearing. This should not exceed .003" (Fig. 13).

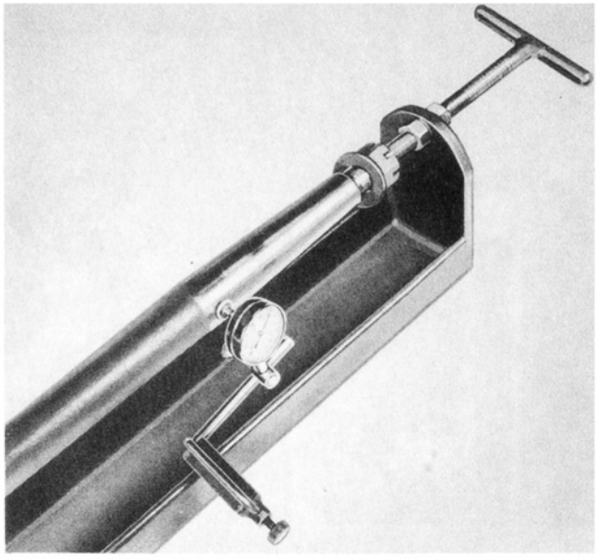


FIGURE 13—*Check the Axle Shaft Outer End for Run-Out.*

Inspecting the Axle Housing

A bent axle or housing may put an excessive strain on axle parts and make the axle noisy. It is, therefore, important to inspect the axle housing for straightness.

Place two straight-edges across the flanges of the housing and measure the distances between their ends (Fig. 14). If the straight-edges are parallel within $\frac{3}{32}$" at a distance of 11" from the tube center, the housing is serviceable. Make this inspection two ways—horizontally and vertically.

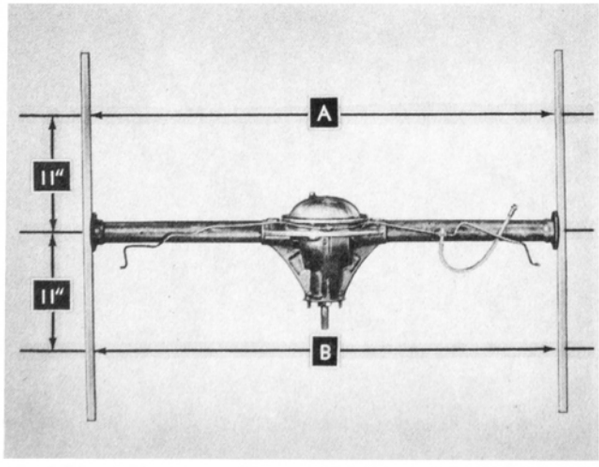


FIGURE 14—*Inspecting Rear Axle Housing For a Bent or Sagged Condition. Dimensions "A" and "B" Should be Equal Within $\frac{3}{32}$".*

Removing the Differential

Remove the differential cover bolts. Note the ratio tag which is held on by one of these bolts, and install it at time of reassembly.

Before removing the differential from the housing, mark the bearing caps with a center punch to insure reassembling in exactly the same positions (Fig. 15).

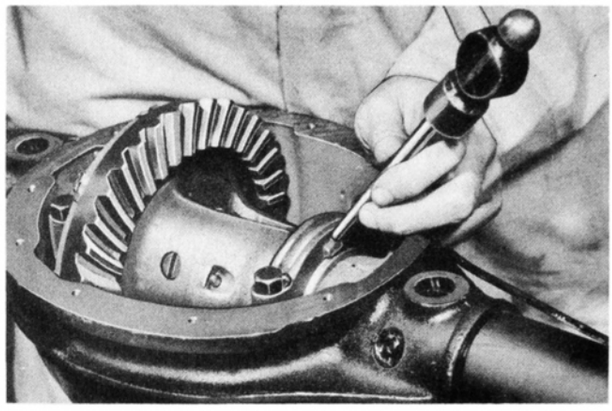


FIGURE 15—*Marking the Bearing Caps Before Removing the Differential.*

Two bars inserted in the differential, as shown (Fig. 16), and pryed against the housing will lift

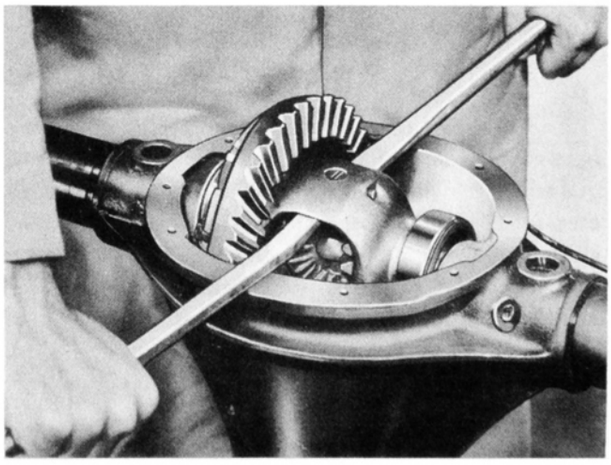


FIGURE 16—*Prying the Differential Out of the Axle Housing.*

the assembly out of the housing. Care should be taken to prevent damaging the bearing cups, rollers, or shims.

Tie the side bearing shims to their respective bearing caps and cups to prevent misplacement whenever the differential is removed.

Pulling the Differential Side Bearings

A special puller (J-2497) is used to remove the side bearing cones from the differential case (Fig. 17). When using this tool, be sure it pulls on the bearing cone in such a manner that the rollers are free. If the puller bears on the roller cage, it will damage the bearing.

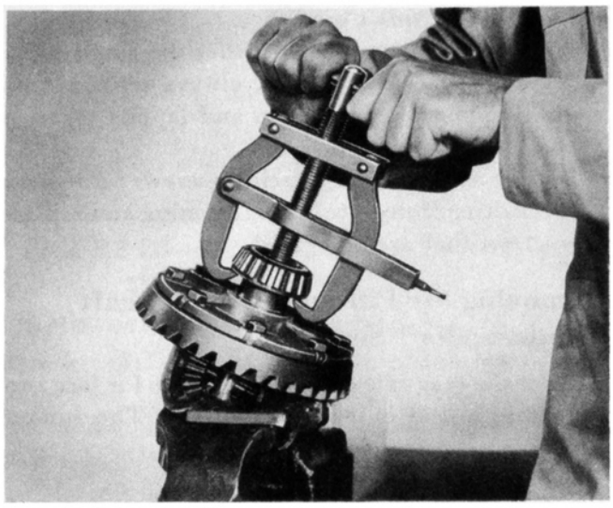


FIGURE 17—*Pulling Differential Side Bearing Using Puller J-2497.*

Removing the Ring Gear

Remove the cap screws that attach the ring gear to the differential case.

(It is good practice to mark the ring gear and case to retain the same location at reassembly.)

Using a brass drift, tap the ring gear from the case. Do not nick the ring gear face of the differential case or drop the gear (Fig. 18).

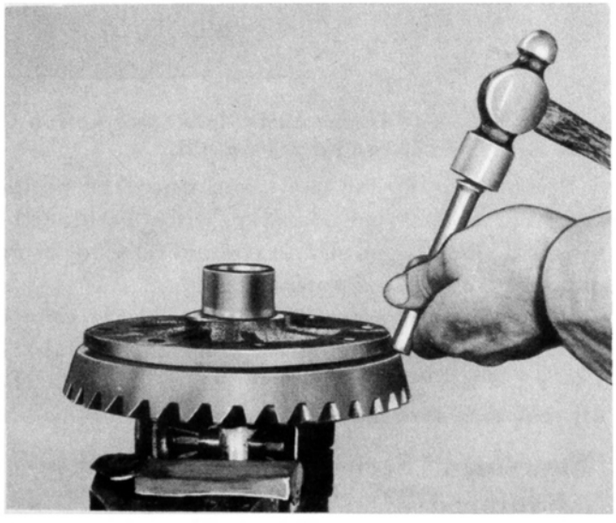


FIGURE 18—*The Ring Gear Should be Tapped Off the Differential Case With a Brass Drift.*

CAUTION: *Do not chisel or wedge the ring gear from the case.*

Removing the Differential Pinion Gears and Shaft

Use a $\frac{3}{16}$" diameter drift at least 3" long to drive out the lock pin that holds the differential pinion shaft in place (Fig. 19).

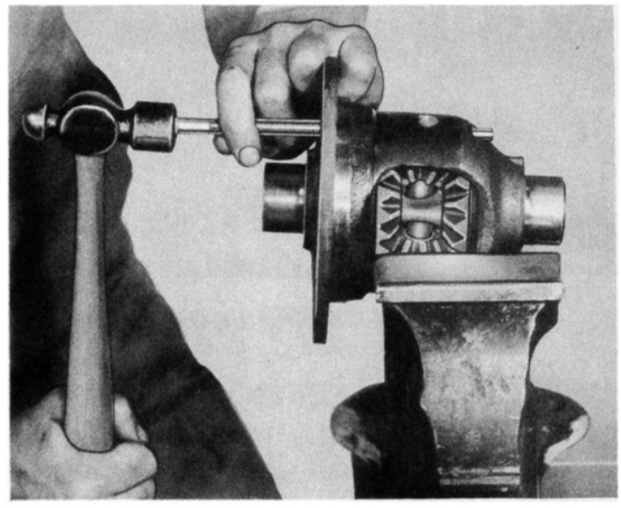


FIGURE 19—*Driving the Pinion Shaft Lock Pin Out of the Differential Case.*

The pinion shaft can then be driven out, and the thrust block can be dropped out through the differential side gear (Fig. 20).

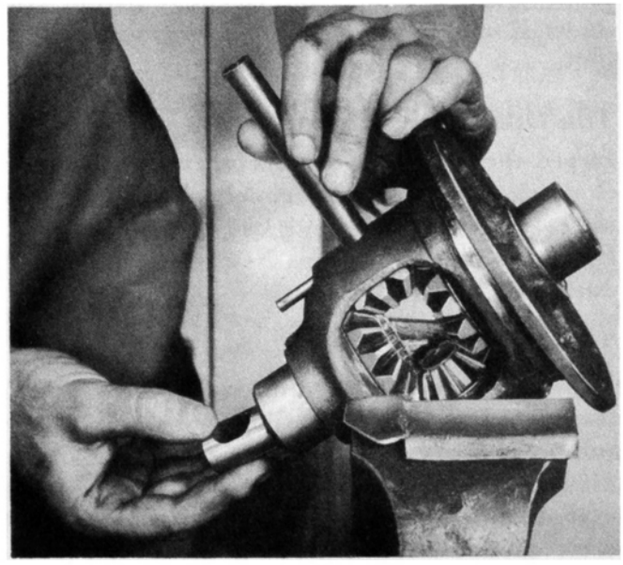


FIGURE 20—*Removing the Differential Pinion Shaft and Thrust Block.*

Roll the differential pinion gears around on the side gears until they can be lifted out through the holes in the case. Then lift out the side gears and their thrust washers (Fig. 21).

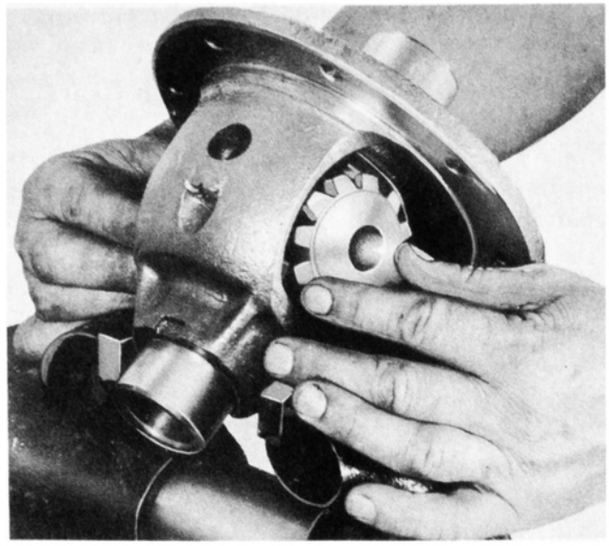


FIGURE 21—*Removing the Differential Pinion and Side Gears.*

INSPECTING DIFFERENTIAL PARTS

The Differential Pinion Gear Shaft

Whenever one rear wheel is stuck and the other is spinning, the differential pinion shaft is subjected to strain. Inspect this shaft for scoring or other signs of wear. The shaft should be a press fit to a .010″ loose fit in the differential case.

Thrust Block

Inspect the thrust block for excessive wear, distortion, and cracks. A thrust block that has been worn or distorted will affect the end play of the axle shafts. If used in this condition, excessive end play of the axle shaft will result.

The Differential Pinion Gears

Inspect the teeth of these gears for excessive wear or chipping. Fit a new differential pinion shaft into the gear to see if the hole is out of round or worn. Discard the thrust washers. New ones will be used during assembly.

The Differential Side Gears

Inspect side gears for worn, cracked, or chipped teeth. The gear should be a snug fit on the axle shaft spline. Also inspect the fit of the side gear in the differential case bore. This clearance should not exceed .007″. This play must be corrected or it will cause excessive backlash in the drive line. If the gears need replacement, pinion and side gears should be replaced as a set.

The Differential Case

Inspect side bearing surfaces for nicks or burrs. Small nicks or burrs may be dressed down with a stone or smooth file.

The Ring Gear

Inspect all the teeth of this gear for wear, cracks, or chipping. Then examine the tooth contact pattern to see if the gear has been meshing correctly with the pinion gear.

If the tooth pattern indicates that the ring and pinion have not been meshing correctly, both gears should be replaced because it is impossible to adjust worn gears for quiet operation.

Whenever replacement of either the ring gear or the pinion gear is necessary, always replace both gears. These gears are run-in and lapped together at the factory as matched sets.

Inspect the ring gear attaching screws for elongation resulting from excessive tightening and replace any screws that are elongated.

Removing the Pinion Gear and Shaft "Ambassador" Series

Inspect the rear axle companion flange for face run-out using a dial indicator (Fig. 22). The run-out should not exceed .002″.

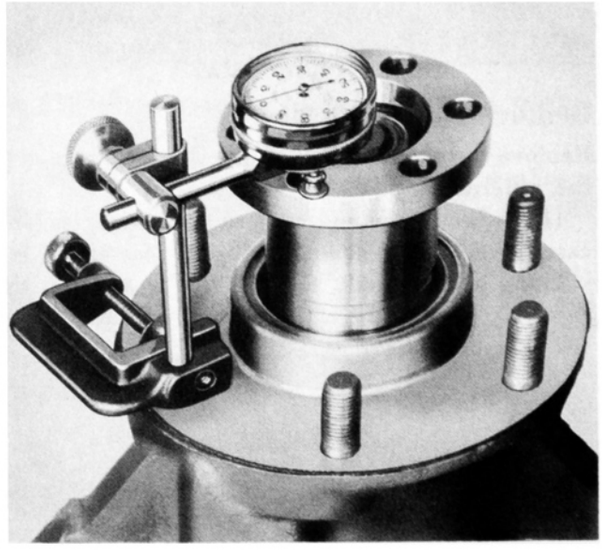


FIGURE 22—Inspect Rear Axle Companion Flange Face Run-out.

Remove the pinion shaft nut, using the pinion shaft nut socket tool (J-1411), while holding the pinion shaft flange. Use extreme care to avoid damage to the flange surfaces.

Remove the companion flange. This is a press fit, use flange puller J-2984 (Fig. 23). DO NOT DRIVE THE FLANGE OFF THE SHAFT. The oil seal may now be removed.

"Statesman" Series—Hydra-Matic Equipped

Remove the companion flange with puller J-2984 (Fig. 23).

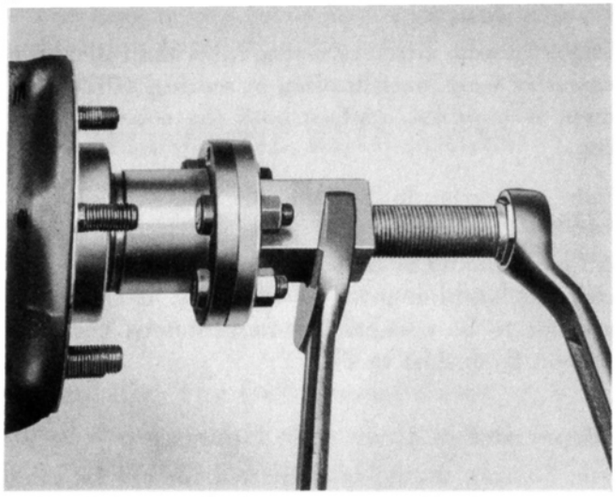


FIGURE 23—*Remove the Rear Axle Pinion Flange with Tool J-2984.*

"Statesman" and "Rambler" Series

Remove the oil seal, bend back the lip of the pinion nut lock, and remove the pinion nut. This can be done by holding the pinion shaft with the pinion holding tool and spacer (J-2496) and loosening the nut using a double offset box wrench.

All Series

Tap the end of the pinion shaft lightly with a fiber hammer to free the front bearing cone from the pinion shaft and remove the bearing (Fig. 24).

A thick shim is located between the bearing and a shoulder on the pinion shaft. This shim controls the pinion bearing preload, therefore, tag the shim to identify it at the time of reassembly.

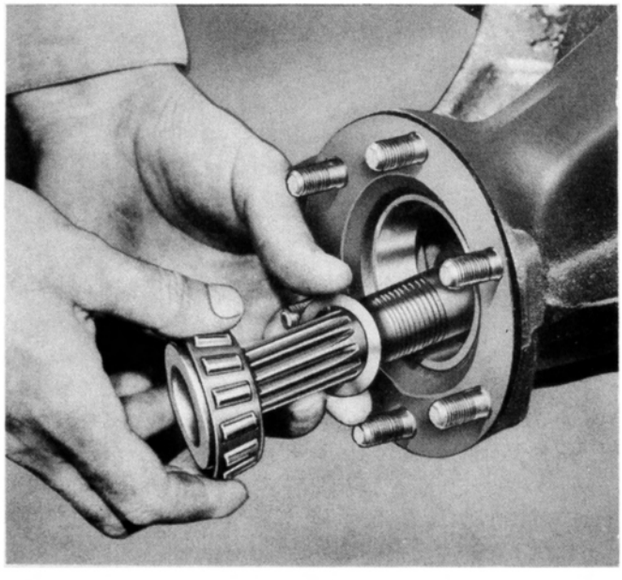


FIGURE 24—*Removing Front Pinion Bearing and Shim. "Statesman" Series Shown.*

The pinion gear and rear bearing may now be removed from the rear of the housing.

Pinion Bearing Cups

A recess is located behind each pinion bearing cup to provide a means of driving the cup from the housing. The cups should be driven out of the housing using a brass punch.

CAUTION: *Keep the cups square in the bore to prevent damaging the cup bores.*

Pulling The Pinion Bearing

The pinion bearing is a press fit on the pinion shaft. Attach pinion bearing remover (J-2245-A "Ambassador" Series, J-2244 for the "Stateman" and "Rambler" series) and remove the pinion bearing using a press (Fig. 25).

Remove the pinion bearing adjusting washer located between the bearing and the pinion gear.

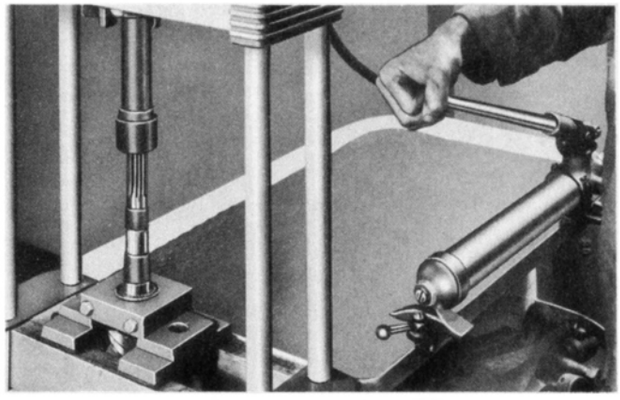


FIGURE 25—*Special Pullers are Used to Remove Pinion Bearing from the Pinion Shafts.*

This washer is used to adjust the pinion depth in the housing and should be tagged to identify it at reassembly.

INSPECTING THE PINION GEAR AND SHAFT ASSEMBLY

Pinion Gear

The pinion and ring gear should be inspected to determine if they are a matched set. Numbers or marks are etched on the rear face of the pinion gear and the edge of the ring gear. The first mark on the pinion should be the same as the mark on the ring gear (Fig. 26).

Inspect the pinion gear for worn, cracked, chipped, or scuffed teeth. (Always replace both gears even though only one may require replacement).

"Statesman" and "Rambler" Series

Inspect the oil seal surface for wear or roughness and the splines for damage caused by a worn or loose coupling.

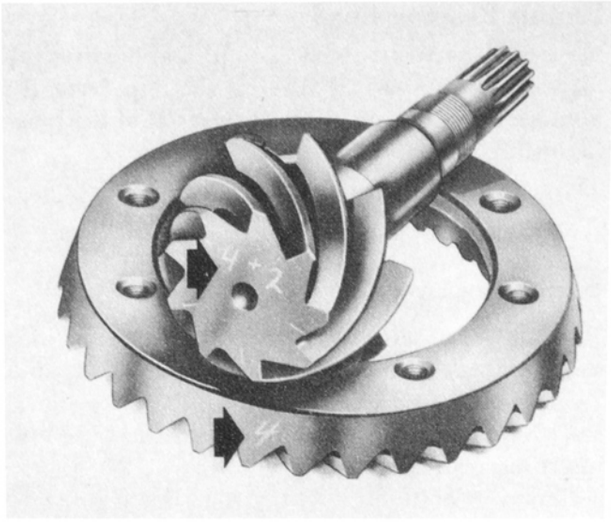


FIGURE 26—*Markings on Ring and Pinion Gear Indicate a Matched Set.*

Pinion Bearings

Inspect pinion bearings, cones, cups, and rollers for excessive wear, over-heating, or scoring. If replacement is required, replace both the cone and the cup.

Cleaning Parts

All parts should be thoroughly cleaned with a good cleaning solution prior to assembly. If the parts are not to be reassembled immediately, cover to protect from dust or dirt.

Inspection of Rear Axle Housing

The housing should be inspected for cracks, sand holes, or burrs, deep scratches, or nicks on the gasket or oil seal areas. A stone or smooth file can be used to remove nicks or burrs.

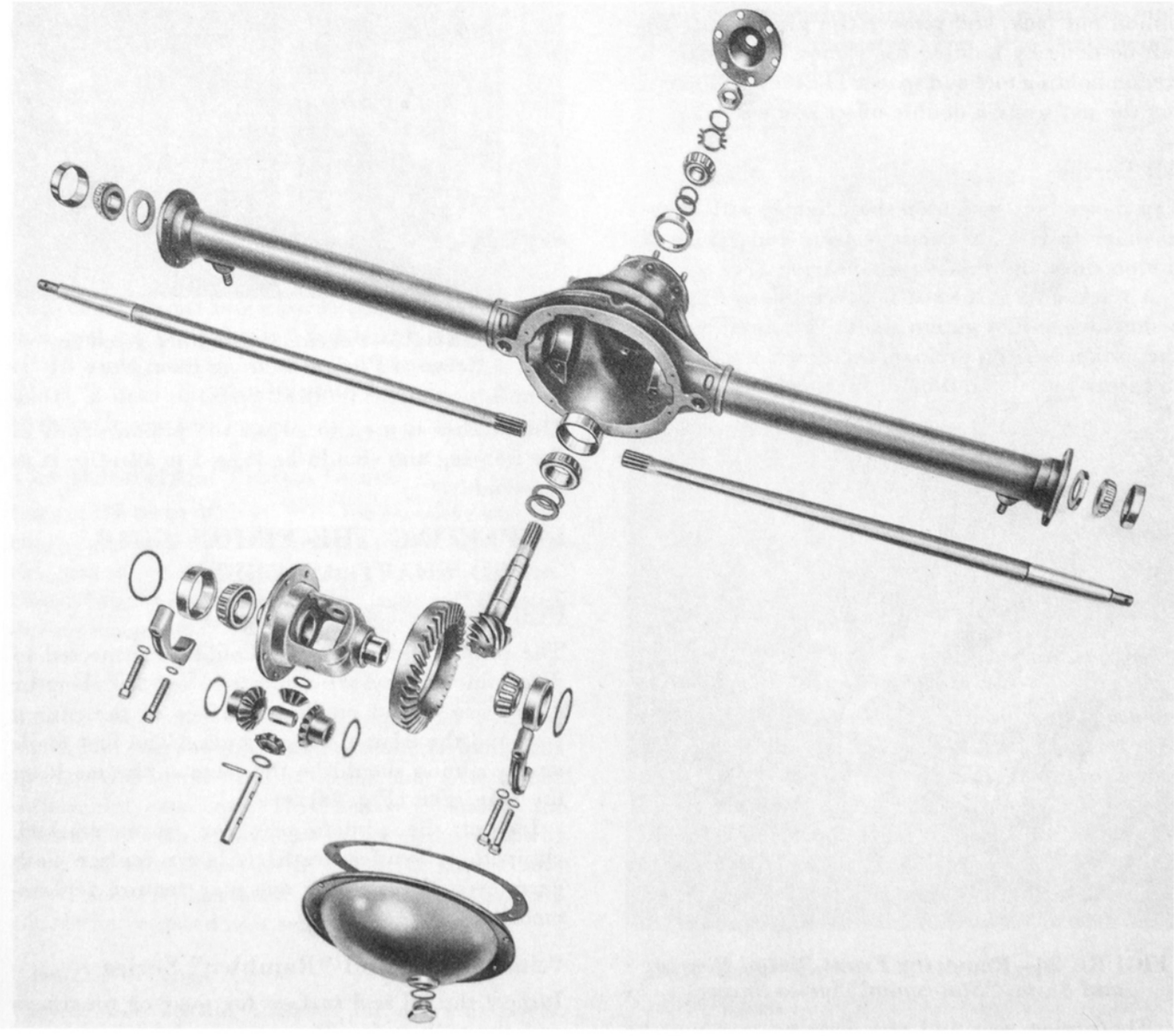


FIGURE 27—"*Statesman*" *Series Rear Axle.*

The bearing cup bores should be carefully inspected for burrs or nicks caused by removing bearing cups.

ASSEMBLING THE REAR AXLES

To insure a uniform method of adjusting rear axles, all specifications for correct adjustment are established on the basis of dry parts.

New thrust washers and oil seals should be installed at time of re-assembly.

Assembling The Differential Gears

Install thrust washers on the side gears, the oil pocket side toward the gear (Fig. 28) and install the gears in the bores of the differential case.

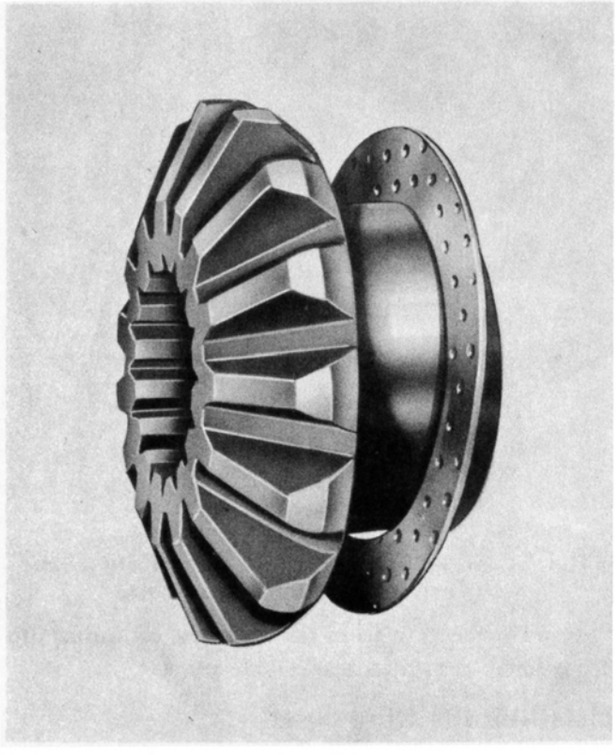


FIGURE 28—*Installing Thrust Washer With the Oil Pockets Toward the Gear.*

Install thrust washers behind the differential pinion gears and mesh the gears with the side gears so the holes are opposite and in line with each other (Fig. 29).

Roll the gears around until the gear holes are aligned with the differential pinion shaft hole in the case.

The pinion gear shaft is installed with the lock pin hole in line with the lock pin hole in the differential case.

Prior to pressing the differential pinion shaft in place, install the thrust block through a side gear, aligning the hole in the block with the differential pinion shaft (Fig. 30).

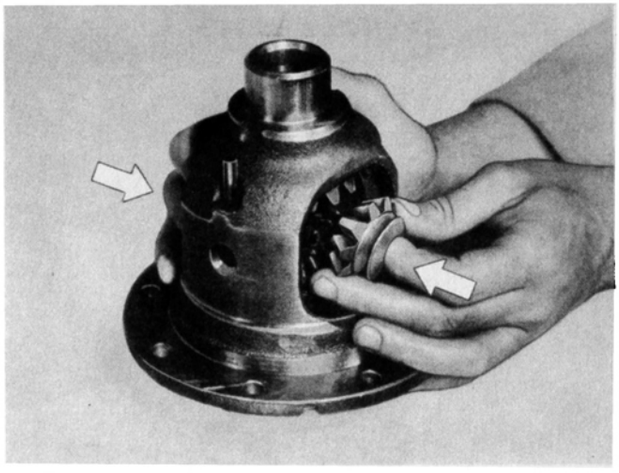


FIGURE 29—*Installing Differential Pinion Gears and Thrust Washers.*

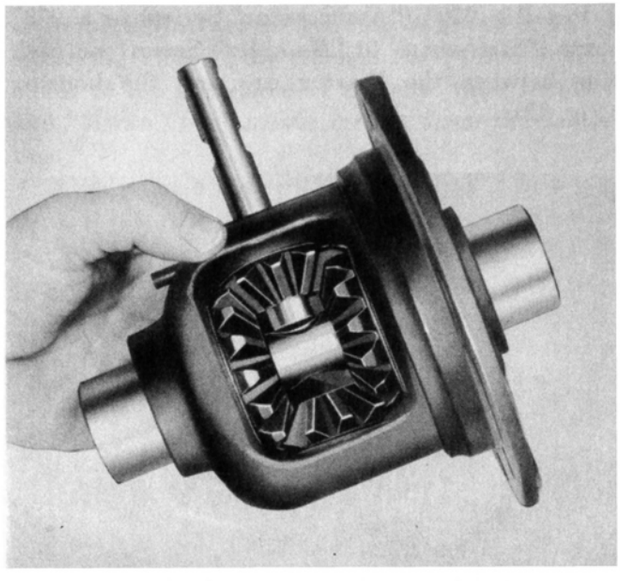


FIGURE 30—*Install the Thrust Block.*

Press differential pinion shaft in place and measure the clearance between the differential side gear and case. This clearance should not exceed .010". However, the side gears should not fit tight enough to require more than eight foot pounds torque to turn the differential gears. This may be checked by installing an axle shaft and using a torque wrench to turn the shaft. Then drive the lock pin into place.

Replacing The Differential Side Bearings

The differential side bearings are pressed onto the case using side bearing replacer J-2104 on the "Ambassador" series and J-2100 on the "Statesman" and "Rambler" series (Fig. 31).

Adjusting the Side Bearings

Place the bearing cup over each side bearing and install the differential case assembly in the axle housing.

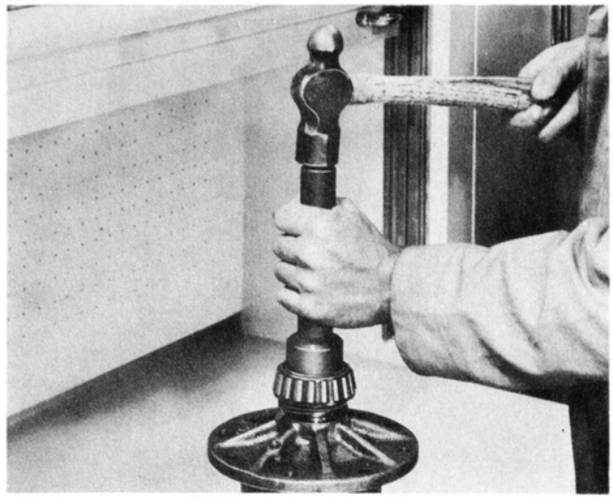


FIGURE 31—*Replacing Differential Side Bearings.*

Install a .070″ ("Ambassador" Series) or a .075″ shim ("Statesman" or "Rambler" Series) on each side between the bearing cup and the housing (Fig. 32).



FIGURE 32—*Install Shims Behind Each Side Bearing Cup to Adjust Side Play.*

Then test the assembly for side play by rotating it and eliminate all side play by installing progressively thicker shims.

"Ambassador" series shims are available in thicknesses from .070″ to .100″ in .002″ variations. "Statesman" and "Rambler" series are available in thicknesses from .075″ to .098″ in .002″ variations.

If an additional thickness of shims is required to eliminate side play, thin shims .003″, .005″ or .010″ may be installed between the cone and the differential case. ("Ambassador" series are available.) For the "Statesman" or "Rambler" series, use "Ambassador" pinion depth adjusting shims.

When side play is eliminated (a slight bearing drag is noted). Then install the respective bearing caps and tighten with a torque wrench to 105-110 foot pounds on the "Ambassador" series and 55-60 foot pounds on the "Statesman" and "Rambler" Series.

Recheck the differential for side play or excessive bearing drag.

Attach a dial indicator to the axle housing and check the ring gear face of the differential case for run-out (Fig. 33). The "run-out" should not exceed .002″.

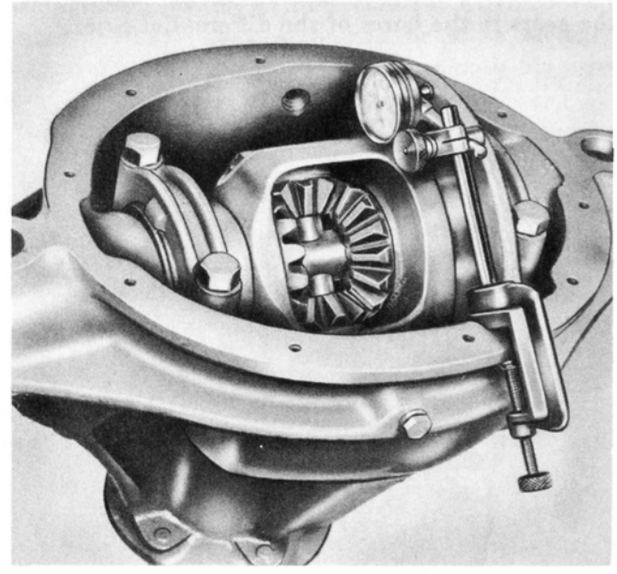


FIGURE 33—*Check the Ring Gear Face of the Differential Case for Run-Out.*

Remove the case from the housing, retaining the shims used to eliminate the side play.

Installing the Ring Gear

Place the ring gear on the differential case, if using the same gear align the marks to retain its original location.

Bolt the ring gear to the differential case with cap screws and new locks. In some cases, two $\frac{3}{8}$″—24x1″ cap screws installed in opposite holes may be used as guides to pull the gear into position.

Tighten the cap screws to 50-55 foot pounds torque "Ambassador" series and 45-50 foot pounds "Statesman" and "Rambler" series.

Installing the Pinion Gear and Bearings

The pinion bearing cups are installed using pinion bearing cup replacing tools (Fig. 34 and 35).

Front bearing tool J-2531 is used for the "Ambassador" series; J-2532 "Statesman" and "Rambler" series.



FIGURE 34—*Installing Front Pinion Bearing Cup.*

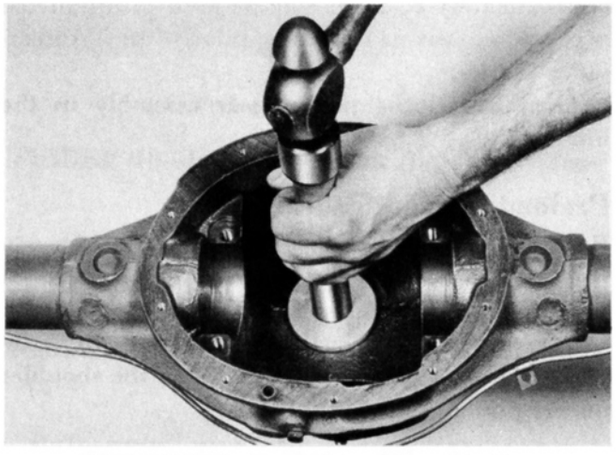


FIGURE 35—*Installing Rear Pinion Bearing Cup.*

Rear bearing tool J-2533 is used for the "Ambassador" series; J-2534 "Statesman" and "Rambler" series.

CAUTION: *Drive the Bearing Cups Straight Into Clean Bores.*

Pinion Depth Adjustment

To compensate for maching tolerances, the pinion and ring gears are tested for tooth contact and quietness. This test is conducted at a standard cone setting and varied to obtain correct tooth contact and quietness.

The amount of this variation is etched on the rear face of the pinion gear (Fig. 36).

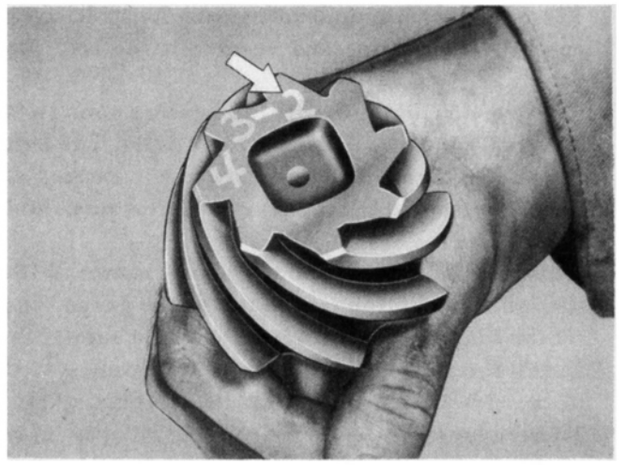


FIGURE 36—*Markings on Ring and Pinion Indicate They are a Matched Set.*

The gear is marked "Plus" or "Minus" the number of thousandths that the gear varies above or below standard. Thus "Plus" means the pinion gear is closer to the centerline of the axle than standard and "Minus" (—) means farther from the centerline.

When using a new ring and pinion set or a new rear bearing, use a new adjusting washer. Adjusting washers are available in two sizes, .105″ and .125″, plus .003″, .005″ and .010″ shims to obtain various thickness combinations. Two methods of determining the correct thickness of adjusting washer may be used.

Method No. 1

The Nash rear axle drive pinion gauge J-2499 makes selection of the right adjusting washer a positive process whether new or original parts are installed (Fig. 37).

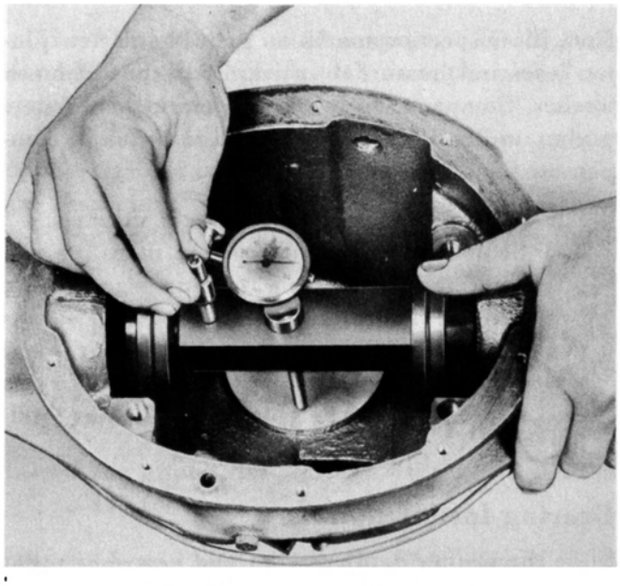


FIGURE 37—*Nash Rear Axle Pinion Setting Gauge.*

Place the rear pinion bearing cone in the bearing cup. Press the cone and revolve it to "set" the rollers.

Bolt the gauge plate over the bearing cone so it does not touch the housing at any point. The bolt runs down through the bearing and is secured at the pinion end of the housing by a cross piece and thumb screw.

Attach a dial indicator to the tool as shown. With the indicator button on the top of the gauge pin; set the dial indicator, under tension, at zero.

Install the tool with the adapters squarely seated in the side bearing bores in the housing.

These adapters slide easily on and off the body of the tool and are reversible. For the "Ambassador" series use with the large diameter outward. For the "Statesman" and "Rambler" series use with the small diameter outward.

Swing the gauge point across the plate until the highest reading is obtained. This reading subtracted from the constant of .140" will give the standard adjusting washer thickness for that housing. Using this figure, add or subtract according to the marking on the pinion to determine the correct adjusting washer.

For Example: When the gauge point is moved across the plate, and a reading of .015" is obtained, subtracting this figure from .140" will give a standard of .125". That means, using a standard "0" pinion, an adjusting washer of .125" thickness would be required. However, if pinion marking read —3 (meaning that it's .003" away from ring gear) it would be necessary to add this .003" to the standard. Thus the adjusting washer and shim combination would be .128".

Method No. 2

Note the inspection marks on the old and new pinion gears and measure the thickness of the old depth washer. Compare the inspection mark on the new pinion and use a depth washer and shims to compensate for the difference.

For Example: If the old pinion is marked +2 and the new pinion is marked —3, there is a difference of .005" away from the ring gear in these two pinions. Therefore, the new depth washer must be .005" thicker than the old one. If the old washer is .123", the new one must be .128". In this case, use a .125" washer plus a .003" shim totaling .128".

Bearing Installation

Slide the proper depth washer and new shims that have been selected onto the shaft against the pinion gear. Using bearing replacing tool J-2995 for the "Statesman" and "Rambler" series, press the bearing tight against the washer and the gear. The large diameter of the bearing should be toward the gear (Fig. 38).

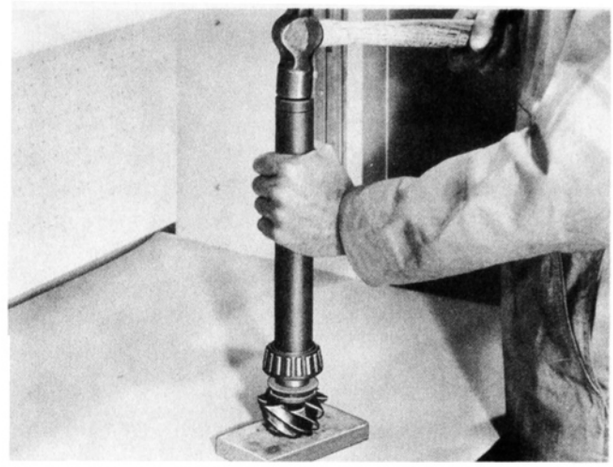


FIGURE 38—*Driver J-2995 is Used to Install the Rear Pinion Bearing on the "Statesman" and "Rambler" Series.*

A piece of steel tubing $1\frac{1}{16}$" inside diameter approximately 8" long, may be used to install the rear pinion bearing onto the pinion of the "Ambassador" series.

Then install the pinion gear assembly in the housing.

Preloading Pinion Bearings

Rear axle pinion bearings are preloaded to compensate for expansion due to heat and loads of operation.

The preload is adjusted by selective shims installed between the front bearing and the shoulder on the pinion shaft (Fig. 39).

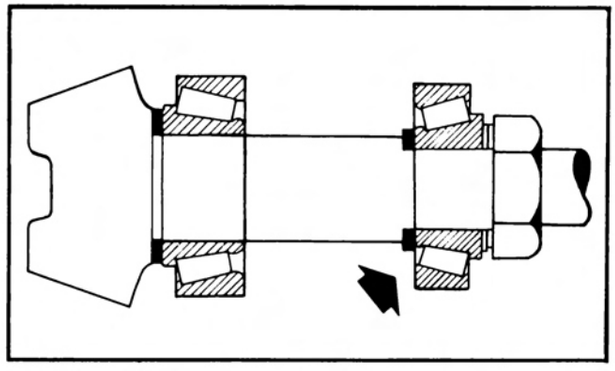


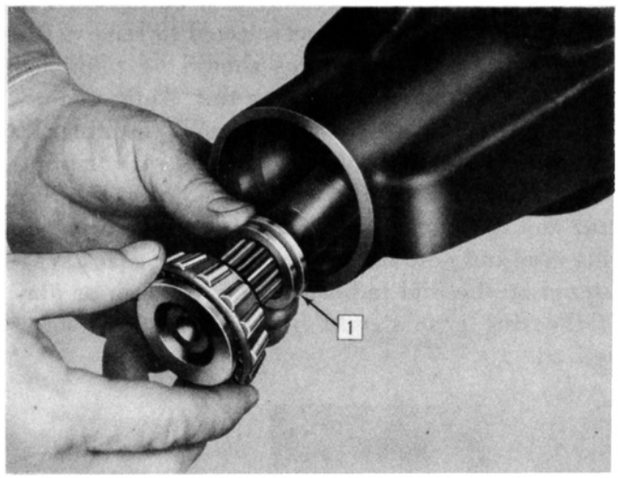
FIGURE 39—*Pinion Bearing Preload Shim Location.*

A thickness range of .106" to .138" in .001" variations can be obtained by using a combination of

two of the following size shims, which are supplied for service installations:

.053″	.063″
.054″	.064″
.056″	.066″
.058″	.068″
.059″	.069″

Install the same thickness of shims as removed and install the front bearing (Fig. 40). (If the adjusting washer thickness was changed compensate for this change.)



1. Preload adjusting shims

FIGURE 40—*Installing Front Bearing Preload Shims and Bearing.*

"Ambassador" Series

Use pinion holding and spacer tool J-2496 and install the spacer in place of the companion flange. Tighten the pinion nut 100 to 135 foot pounds torque.

"Statesman" and "Rambler" Series

The bearing is held in position by the pinion nut, thrust washer, and lockwasher; tighten the pinion nut 90 to 95 foot pounds torque.

All Series

The pinion holding tool and spacer J-2496 is used in combination with a spring scale to get inch-pound readings. The tool is so designed that the splined ends are exactly 6 inches from the center of the handle. Attach the spring scale to the center of the handle, pull the tool in a circular rotation (Figs. 41 and 42), note the reading in pounds on the scale and multiply it by 6. This determines the number of inch-pounds needed to turn the shaft. To eliminate the effect of gravity, turn the axle up so that the pulling effort is on a horizontal plane.

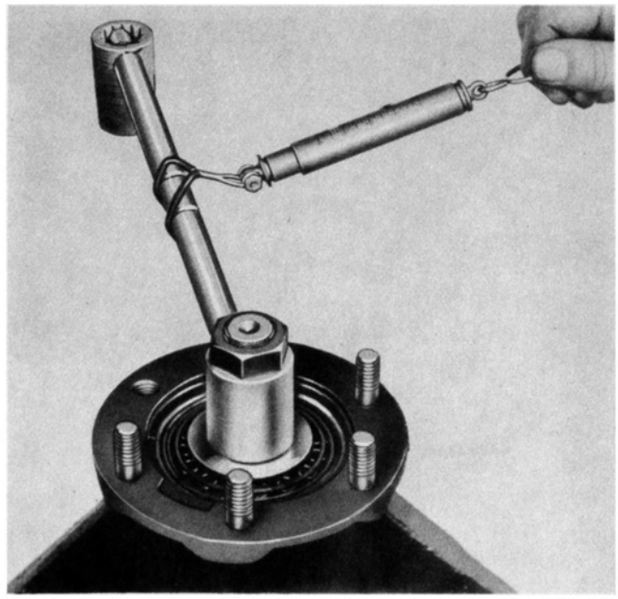


FIGURE 41—*Checking Pinion Bearing Preload "Ambassador" Series.*

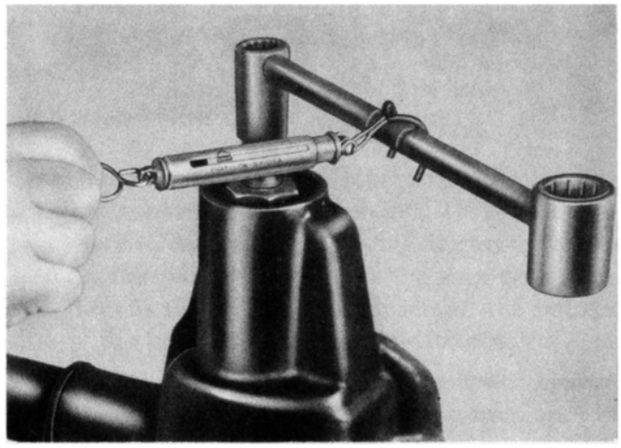


FIGURE 42—*Checking Pinion Bearing Preload "Rambler" Series Shown.*

The "Ambassador" series requires 15 to 18 inch-pounds and the "Statesman" and "Rambler" require 12 to 14 inch-pounds preload.

In the example shown, it requires 2½ pounds at 6 inches, or 15 inch-pounds to turn the shaft (within the limits for the "Ambassador" Series).

If the preload is too high, increase the thickness of the shims, if it is too low, decrease the thickness.

"Ambassador" Series

Remove the spacer tool and install a new oil seal.

The companion flange is then installed using companion flange installer J-1375 (Fig. 43).

Install the pinion nut and lockwasher and tighten 105 to 110 foot pounds torque.

"Statesman" and "Rambler" Series

Install the *lockwasher next to the bearing* then the plain thrust washer and nut. Tighten the nut 90 to

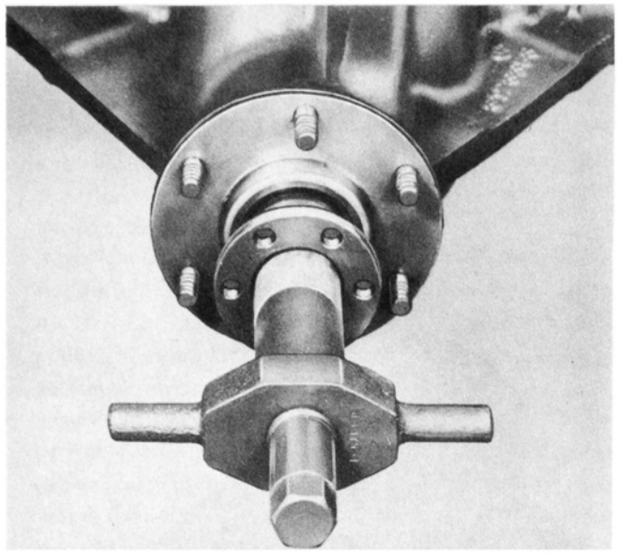


FIGURE 43—*Use J-1375 to Install the Companion Flange.*

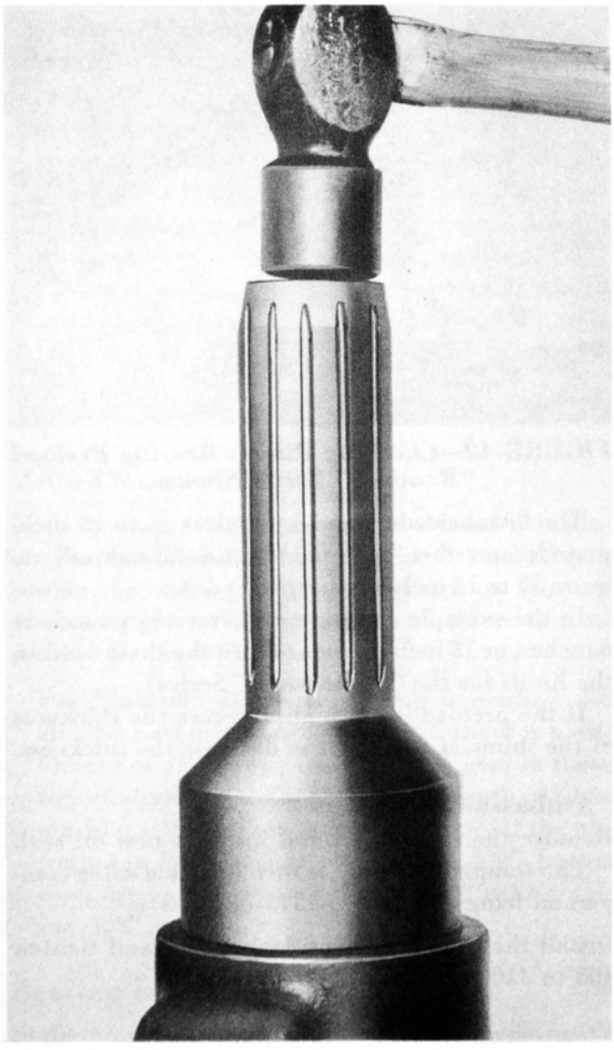


FIGURE 44—*Installing Pinion Oil Seal "Rambler" Series.*

95 foot pounds torque. Install the pinion oil seal on the "Statesman" series. Use tool J-4485 to install the pinion oil seal on the "Rambler" Series.

"Statesman" Series—Hydra-Matic Equipped

Press the pinion shaft companion flange onto the pinion shaft while supporting the shaft from the rear to prevent damage to the bearings or axle housing.

Adjusting Ring Gear and Pinion Backlash

The differential assembly may now be installed in the housing using the shims selected to remove the side play. The bearing caps should be tightened (105-110 foot pounds torque on the "Ambassador," 55-60 foot pounds "Statesman" and "Rambler"). Attach a dial indicator to the housing with the button contacting the pull side of a tooth on the ring gear and at right angles to it (Fig. 45). "Rock" the ring gear and note the movement of the gear as registered on the dial indicator. The backlash or play of the ring gear should be .002″ to .006″, .004″ desired.

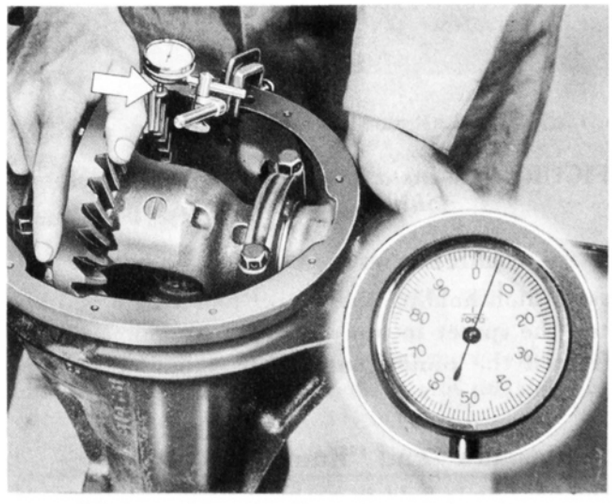


FIGURE 45—*Checking Ring Gear and Pinion Backlash.*

Adjust the backlash as follows: To increase backlash, install a thinner shim on the ring gear side and a thicker shim on the opposite side; to decrease backlash, reverse the procedure. However, do not change the total thickness of the shims.

For Example: The side play was removed with .090″ shims on each side totaling .180″. The backlash is checked and found to be .011″. To correct the backlash, add .006″ to the shim on the ring gear side and subtract .006″ from the opposite side. This will result in a .096″ shim on the ring gear side and .084″ shim on the other side. The backlash will be .005″. The total shim thickness remains .180″.

Preloading Differential Side Bearings

The rear axle differential bearings are preloaded to compensate for the heat and loads during operation. The correct preload is .004″ to .006″.

The side bearings may be preloaded in two ways; by installing a .004″ to .006″ thicker shim on one side or by increasing both shims in thickness so the total thickness of the shims is .004″ to .006″ greater than the thickness with the side play removed.

Installing the Differential Assembly

Assemble the side bearing cups and shims on the side bearings. The bearing cups should completely cover the rollers of the side bearings. Lower the assembly into the axle housing until the bottom edge of the bearing cups and shims are started in the bearing bore (Fig. 46).

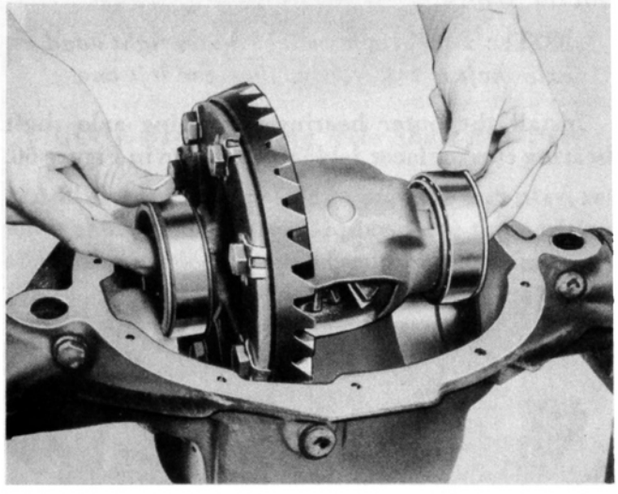


FIGURE 46—*Install the Differential Assembly.*

Keep the differential assembly square in the housing and *push it down* as far as possible.

Using a soft hammer, tap the outer edge of the bearing cups until seated in the housing.

CAUTION: *Do Not Distort the Shims By Hammering Them Into the Housing.*

Install the bearing caps and tighten (105 to 110 Foot Pounds Torque "Ambassador" and 55 to 60 Foot Pounds "Statesman" and "Rambler" series). Preloading the side bearings may change the backlash setting, therefore, recheck the backlash and correct if necessary.

Inspecting Tooth Contact

Inspect the tooth contact pattern to insure that the ring and pinion gears are adjusted properly.

Paint eight or ten teeth of the ring gear with a light coat of red lead in oil.

Turn the ring gear around until the painted section of the ring gear is in contact with the pinion gear. Turn the pinion with a wrench while holding the ring gear with the other hand. This causes the two gears to turn under load and impresses a pattern on the painted section of the ring gear (Fig. 47). This is the tooth contact pattern, the pattern that is the final proof of the adjustments.

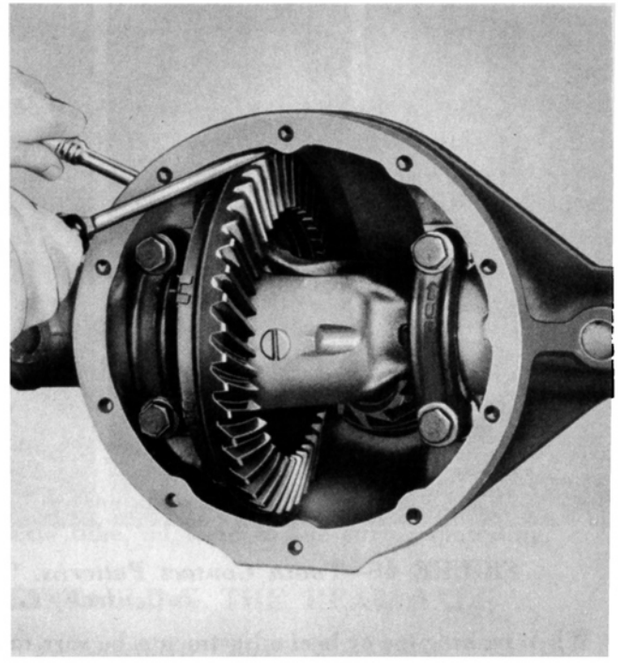


FIGURE 47—*A Tooth Contact Pattern is Obtained by Painting Eight or Ten Teeth of the Ring Gear, Meshing the Painted Section with the Pinion Gear, Then Turning the Gears Under Load.*

If all adjustments are correct, the tooth contact pattern will be distributed over the central part of the tooth as in Figure 48-A.

If the pattern is high on the ring gear, as in Figure 48-B, it means the pinion is too far from the ring gear. In that case, move the pinion toward the ring gear by placing a thicker washer or shim between the pinion gear and bearing.

If the pattern is low on the ring gear tooth, as in Figure 48-C, the pinion is too close to the ring gear. Then move the pinion away from the ring gear by placing a thinner washer or shim between the pinion gear and bearing.

If the pattern is toward the small end or "toe" of the tooth, as in Figure 48-D, the ring gear is too close to the pinion. In that case, move the ring gear away from the pinion by putting a thinner shim on the left side and a thicker shim on the right.

If the pattern is at the large end or "heel" of the tooth, as in Figure 48-E, the ring gear is too far from the pinion. Then move the ring gear toward the pinion, by putting a thinner shim on the right side and a thicker shim on the left side.

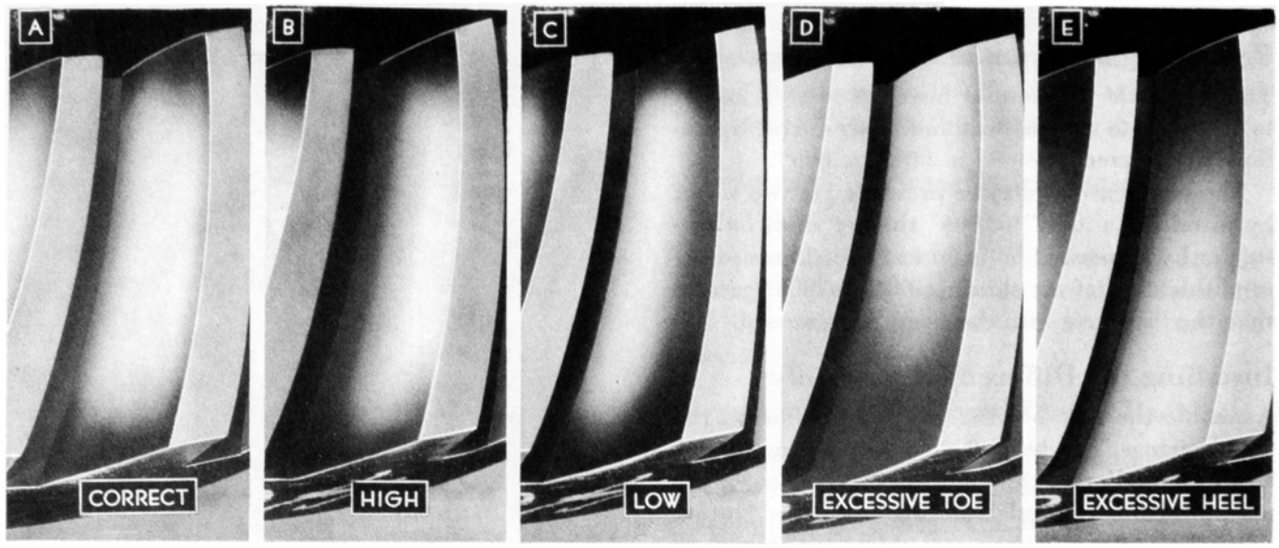


FIGURE 48—*Tooth Contact Patterns. "A" Illustrates Correct Tooth Pattern Which is Centrally Located on the Tooth.*

When making toe or heel adjustments, be sure to keep the same total thickness of shims at the side bearings.

Replacing Axle Shaft Bearings

Press axle shaft bearings onto the axle shafts with the small diameter of the cone toward the outer tapered end of the shaft using bearing replacing tool J-2995.

Installing Axle Shafts

The inner axle oil seal is extremely important. Always use new seals when reassembling an axle. Soak the seals in light lubricating oil to make them soft and pliable and to prevent being burned in operation. Install the seal using the shaft oil sealer replacer (J-2539 on the "Ambassador" Series, J-2626 on the "Statesman" Series, and J-4484 on the "Rambler" Series) (Fig. 49).

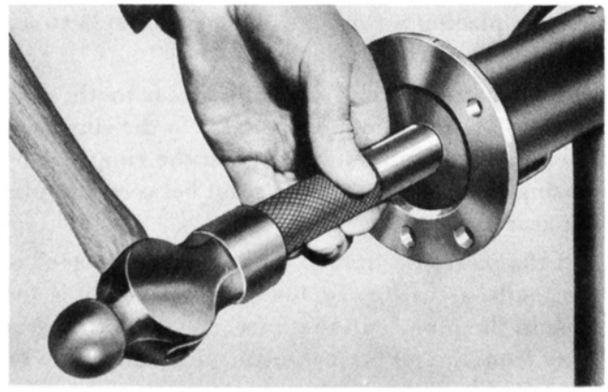


FIGURE 49—*Installing Inner Oil Seal ("Statesman" Series Shown).*

Install the axle shafts indexing the splined end with the differential side gears. Lubricate the bearing.

NOTE: *The "Ambassador" Series right hand axle shaft is 1½" longer than the left one.*

Install the outer bearing cup using axle shaft bearing cup replacer J-1433-1 as shown in Figure 50.

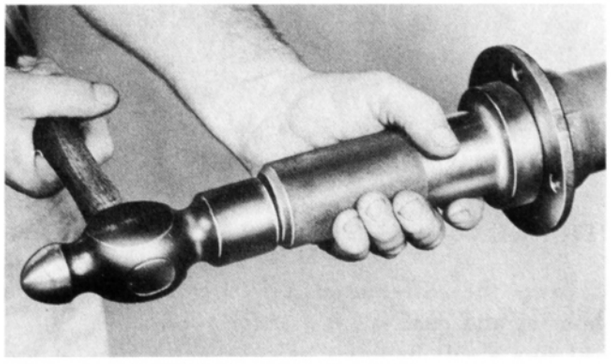


FIGURE 50—*Installing Axle Shaft Bearing Cup.*

Installing the Brake Support Plates

Install the original shims onto the axle with the drain hole aligned with the hole in the axle tube (if the end play was checked at the time of disassembly and required correction, a correction can be made at this time). Install the brake support plate, spacer, and oil seal. Tighten the support plate bolts to 50-55 foot pounds torque on the "Ambassador," and 30-35 foot pounds "Statesman" and "Rambler" series.

Checking and Adjusting Axle Shaft End Play

Strike the end of each axle shaft with a lead hammer to seat the bearing cups against the support plate.

Attach axle shaft end play tool J-2092 to the end of one shaft, affix a dial indicator to the support plate or to the tool and check the play when pushing and pulling on the axle shaft (Fig. 51). End play should be .002″ to .004″.

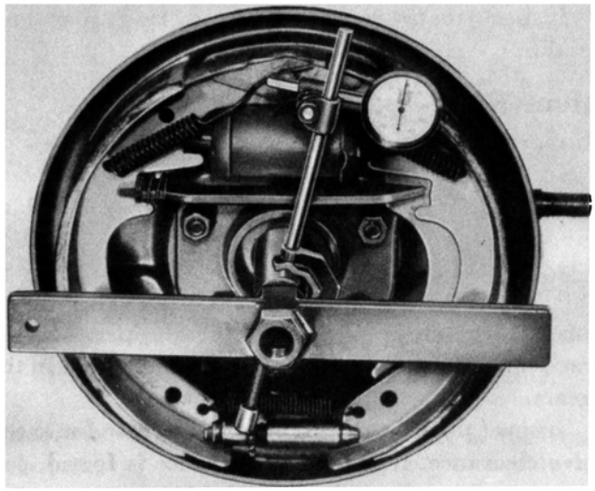


FIGURE 51—*Checking Axle Shaft End Play.*

Add shims to either side to increase end play, remove shims to decrease end play. Note the position of the thrust block, there should be a minimum of 1/16″ clearance between the thrust block and the differential pinion shaft.

Installing the Wheel Hub

NOTE: *This operation is performed on the "Rambler" series after the rear axle has been installed in the car.*

Inspect the hub key for a snug fit in the keyways of the axle shaft and hub (Fig. 52).

The tapers of the hub and axle shaft must be clean and dry.

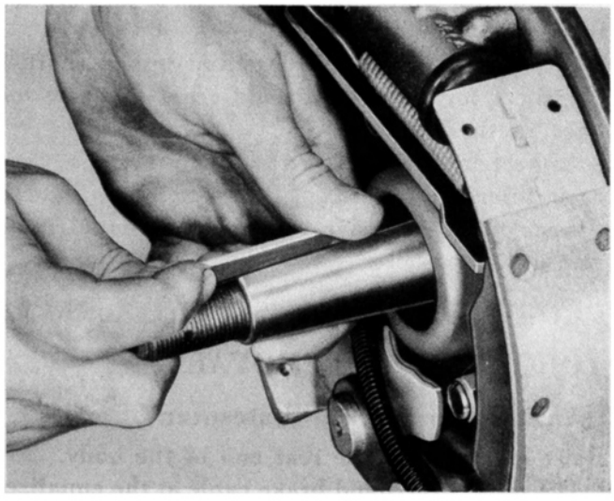


FIGURE 52—*The Key Should Fit Smoothly and Tightly into the Axle Shaft Keyway.*

Slide the hub onto the axle shaft aligning the keyways; install the key and press the hub onto the shaft. The key should be flush with the hub.

Install the thrust washer and axle nut and tighten 180 to 190 foot pounds torque on the "Ambassador" Series; 160 to 165 foot pounds torque "Statesman" and "Rambler" Series. (If the cotter key holes are not in line, tighten the nut to the next castellation).

Completing the Assembly

Reinstall the axle in the car; fill the axle with specified hypoid lubricant. Inspect the housing vent; a closed vent will cause pinion seal or axle oil seal failure. The vent is a small drilled hole, located on a horizontal center line at the rear side of the left axle tube, adjacent to the spring mounting.

INSTALLING THE REAR AXLE

"Ambassador" and "Statesman" Series

Install the propeller shaft torque tube and truss rods on the rear axle. The propeller shaft companion flange bolts should be tightened 30-35 foot pounds torque on the "Ambassador" Series and the Hydra-Matic equipped "Statesman." The "Statesman" Series propeller shaft coupling nut should be tightened to 300 foot pounds of torque.

Slide the propeller shaft front universal joint onto the transmission main shaft, raise the rear axle into position, and reassemble the torque tube to the transmission.

Reconnect the rear springs, brake line, hand brake cables, and bleed the brake lines.

"Rambler" Series

Slide the propeller shaft onto the transmission main shaft until it is bottomed on the shaft. Then mark the front universal joint at the rear of the transmission oil seal and again remove the propeller shaft.

Install the propeller shaft on the rear axle pinion, and install the rear springs on the axle tubes.

The axle assembly is then installed on the car.

Reconnect the brake lines, rear shock absorbers, rear springs, brake cables and install the rear wheel hubs.

With the body supported at the body side sills, permit the rear axle assembly to band freely with the shock absorbers fully extended. Adjust the propeller shaft so the scribe mark is 5/32″ to the rear of the transmission oil seal. Tighten the coupling to 300 foot pounds torque.

Final Inspection

The rear axle should then be road tested to determine if all the adjustments and corrections are satisfactory.

DIAGNOSING AXLE TROUBLES

Test No. 1

With the engine warmed up and the overdrive locked in conventional gear position, drive at ten miles per hour. Listen carefully and keep driving at this speed until thoroughly familiar with all car noises.

Now gradually increase the speed until the car reaches forty-five miles an hour. As the car is gaining speed, notice any changes in the running gear noises; notice the speed at which each noise comes in and goes out.

Then release the accelerator, and without using the brakes, allow the car to slow down. Again, make a note of every change in sound and the speed at which each change takes place.

It will probably be found that every sound comes in and leaves at the same speeds on both acceleration and deceleration.

Test No. 2

Step the car up to fifty miles per hour, shift into neutral, turn off the ignition, and allow the car to coast until it comes to a stop. Listen again to all the running noises. Notice at very low speeds a low pitched sound will come in; this is tire noise, not axle noise.

While making this test, note again all the changes in running noise and the speeds at which they come in and go out. Any of the noises noted in Test No. 1 which also appear in Test No. 2 can be eliminated as axle noise because, on this test, the axle is not under load and will produce no noise other than bearing noise.

If, however, there are any noises which appeared in the first test but did not appear in the second test, they may be in the rear axle. To find out make Test No. 3.

Test No. 3

Park the car with the engine running and apply the parking brakes. Then slowly accelerate the engine, comparing again all noises with those heard in the previous tests. Any sounds still left from Test No. 1 which are heard in this test can be disregarded. They are probably muffler, air cleaner, or body vibrations.

Test No. 4

Finally raise the rear wheels off the ground, put the car in gear and run the engine. Now analyze the noises that haven't been eliminated to see if they actually come from the rear axle.

NOISES TO WATCH FOR AND WHAT TO DO ABOUT THEM

Hum While Pulling

Inspect adjustment of bearings on axle shaft, pinion shaft, or differential.

Inspect tooth contact between ring gear and pinion.

Hum While Coasting

Inspect condition of rear axle wheel bearings.

Inspect pinion gear depth. Pinion may need to be moved away from the ring gear—or toward ring gear.

Thumping

Inspect for chipped gear teeth, chipped bearing races or rollers, or a piece of metal imbedded in the gears.

Inspect the side gear to differential case for excessive clearance. If excessive clearance is found, correct it and inspect axle shafts for excessive run-out.

Excessive Backlash

This may or may not be due to the rear axle. Other causes of backlash may be:

A badly tuned engine.
A loose clutch disc.
Excessive play in transmission gears and shafts.
Loose universal joints or flanges.

If backlash proves to be in the rear axle these are the things to do:

Inspect for wheel hubs loose on the axle shafts.

Inspect for too much play between ring gear and pinion.

Inspect for end play in the pinion shaft.

Noise on Turns

Inspect for differential pinion gears that are too tight on the shaft.

Inspect for a scored differential pinion shaft.

Inspect for differential side gears that are too tight in the case.

Inspect for chipped, scuffed, or otherwise damaged differential gears.

Inspect for excessive wear of differential gears and thrust washers.

PROPELLER SHAFT SECTION

TORQUE TUBE REMOVAL

"Ambassador" and "Statesman" Series

Raise and support the rear end of the body.

Disconnect the hand brake cable at the equalizer and remove the hand brake bell-crank assembly from the torque tube (Fig. 53).

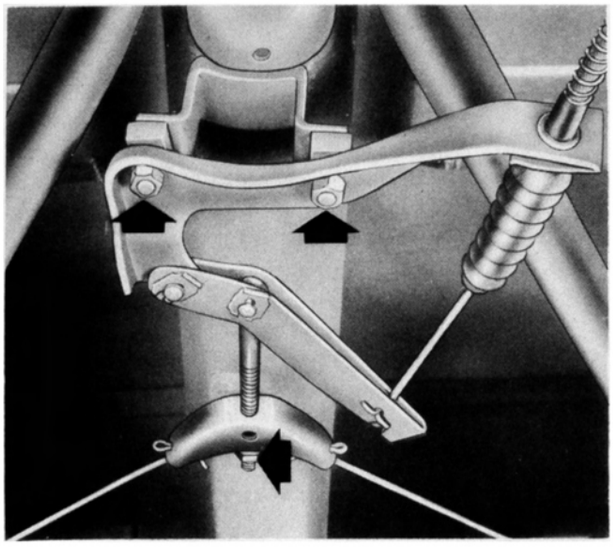


FIGURE 53—*Disconnect at These Points.*

Disconnect the rear axle stabilizer bar at the rear axle tube.

"Ambassador" Series

Remove the truss rods at the axle tubes and at the center bracket on the torque tube.

Disconnect the torque tube from the transmission adapter and move the axle and tube to the rear. This will allow the universal joint, which is a light press fit, to be removed from the front of the propeller shaft.

Disconnect the rear of the torque tube from the rear axle housing and move the tube forward. This will permit the propeller shaft flange to be disconnected (Fig. 54).

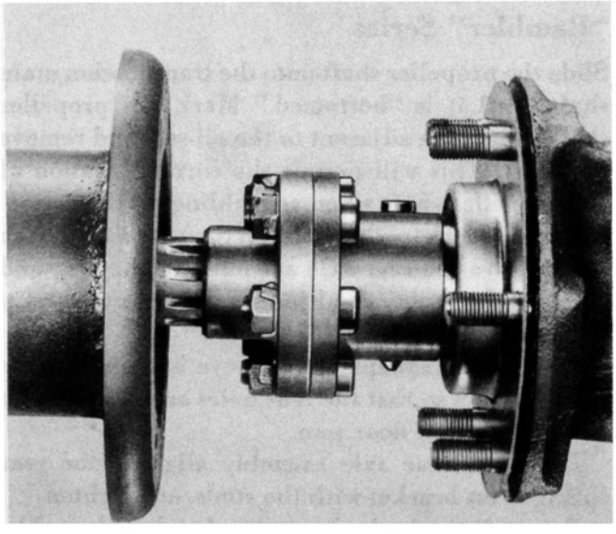
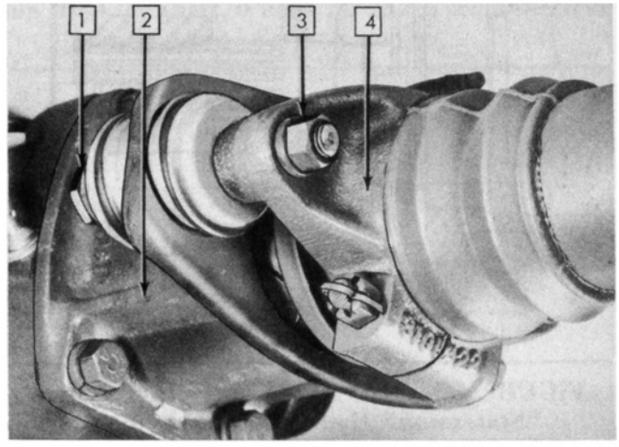


FIGURE 54—*"Ambassador" Series Propeller Shaft Companion Flange.*

When reinstalling the propeller shaft, use new locks on the companion flange nut. Tighten the flange nuts 30 to 35 foot pounds torque.

"Statesman" Series

Disconnect the truss rods at the center bracket. Then disconnect the trunnion bracket from the adapter by removing the rear nuts from the dowel studs (Fig. 55).



1. Front Stud Nuts
2. Adaptor
3. Rear Stud Nuts
4. Trunnion Bracket

FIGURE 55—*Remove Trunnion Bracket Rear Nuts.*

Move the torque tube and axle to the rear to clear the studs. The universal joint, which is a light press fit, may now be pried from the splines on the propeller shaft.

Disconnect the torque tube from the rear axle housing and move the tube forward as shown in Figure 56.

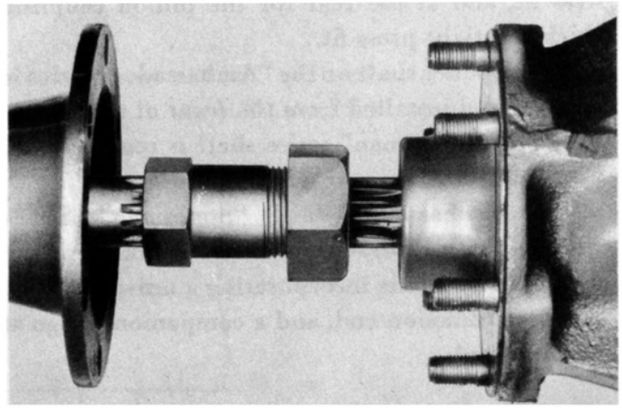


FIGURE 56—*"Statesman" Series Propeller Shaft Coupling.*

Loosen the coupling nut and disconnect the coupling from the pinion shaft. When installing the propeller shaft, tighten the coupling to *300 foot pounds torque.*

"Statesman" Series Hydra-Matic Equipped

The propeller shaft utilizes a companion flange similar to the "Ambassador" Series (Fig. 57).

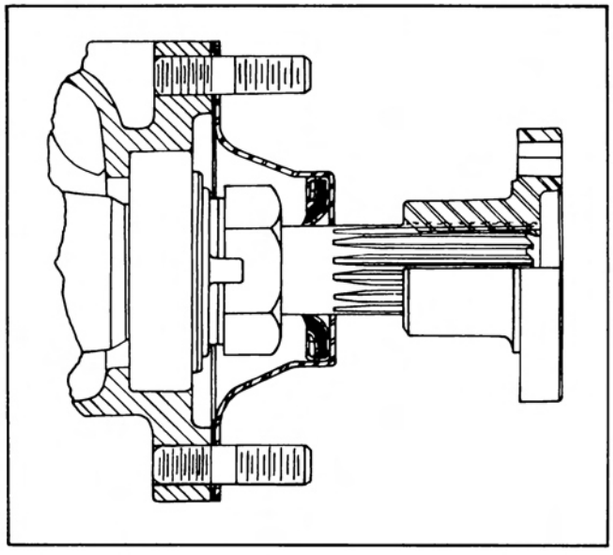


FIGURE 57—*Rear Axle Companion Flange "Statesman" Hydra-Matic Equipped.*

NOTE: *When pressing the companion flange onto the pinion shaft, support the pinion from the rear to prevent damage to the bearings or the housing.*

PROPELLER SHAFTS

"Ambassador" and "Statesman" Series

The propeller shaft on the "Ambassador" and "Statesman" Series (regular transmission or overdrive) are solid steel shafts, splined at each end; at the front end for the universal joint which is a light press fit, and at the rear for the pinion coupling which is a tight press fit.

The propeller shaft on the "Ambassador" series is removed and installed from the *front* of the torque tube. The "Statesman" series shaft is removed and installed from the *rear* of the torque tube.

The "Ambassador" and "Statesman" Series equipped with Hydra-Matic Transmission have one piece tubular shafts incorporating a universal joint at the transmission end, and a companion flange at rear axle end.

"Rambler" Series

Raise and support the rear of the body at the side sills and the rear axle at the center of the housing.

Loosen the propeller shaft coupling using propeller shaft coupling wrenches J-4486 (Fig. 58).

Disconnect the rear shock absorbers at the rear axle tubes, the hand brake cable at the adjusting

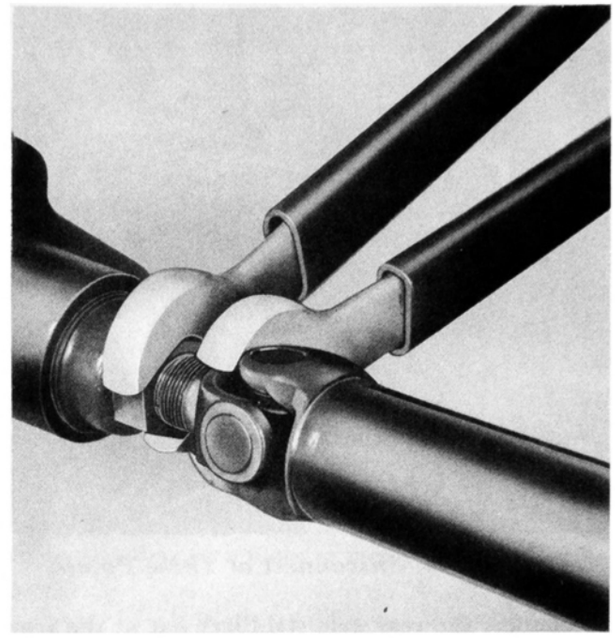


FIGURE 58—*Loosening the Propeller Shaft Coupling.*

yoke, and the rear brake hose clip from the body floor pan.

Remove the rear spring front bracket attaching nuts, and lower the rear axle, continuing to support the body, thus lowering the rear spring front brackets from the floor pan.

Move the axle assembly to the rear sliding the propeller shaft yoke off the transmission main shaft splines.

Then remove the propeller shaft from the pinion shaft.

Installing the Propeller Shaft

"Rambler" Series

Slide the propeller shaft onto the transmission main shaft until it is "bottomed." Mark the propeller shaft front yoke adjacent to the oil seal and remove the shaft. This will permit the correct location of the propeller shaft when assembling on the car.

Install the propeller shaft on the rear axle pinion shaft. Move the rear axle assembly to the rear and slide the front universal joint yoke onto the transmission main shaft.

Loosen the rear spring front eye bolt and tilt the front bracket so that the rear holes are aligned with the studs in the floor pan.

Raise the rear axle assembly aligning the rear spring front bracket with the studs, and tighten.

Reinstall the brake hose clip, hand brake cable, and the rear shock absorbers.

Permit the rear axle assembly to hang freely, the shock absorbers fully extended, and move the shaft

to the front or rear to locate the mark on the propeller shaft 5/32" to the rear of the transmission oil seal. Then tighten the propeller shaft coupling to *300 foot pounds torque.*

PROPELLER SHAFT CENTER BEARING

Prelubricated, rubber-mounted ball bearings are used on the "Ambassador" and "Statesman" Series equipped with standard or overdrive transmissions. The "Statesman" Series with 4.4:1 (8:39) axle ratio is equipped with two center bearings installed as illustrated in Item "B," Figure 59.

The bearings are retained on the propeller shaft with snap rings and/or a machined shoulder to the rear of the bearing.

To facilitate the removal and installation of the propeller shaft center bearing, the shaft is machined .003" undersize from the front of the shaft to the bearing seat. Therefore, to remove the bearing from the shaft, it must be driven from the rear

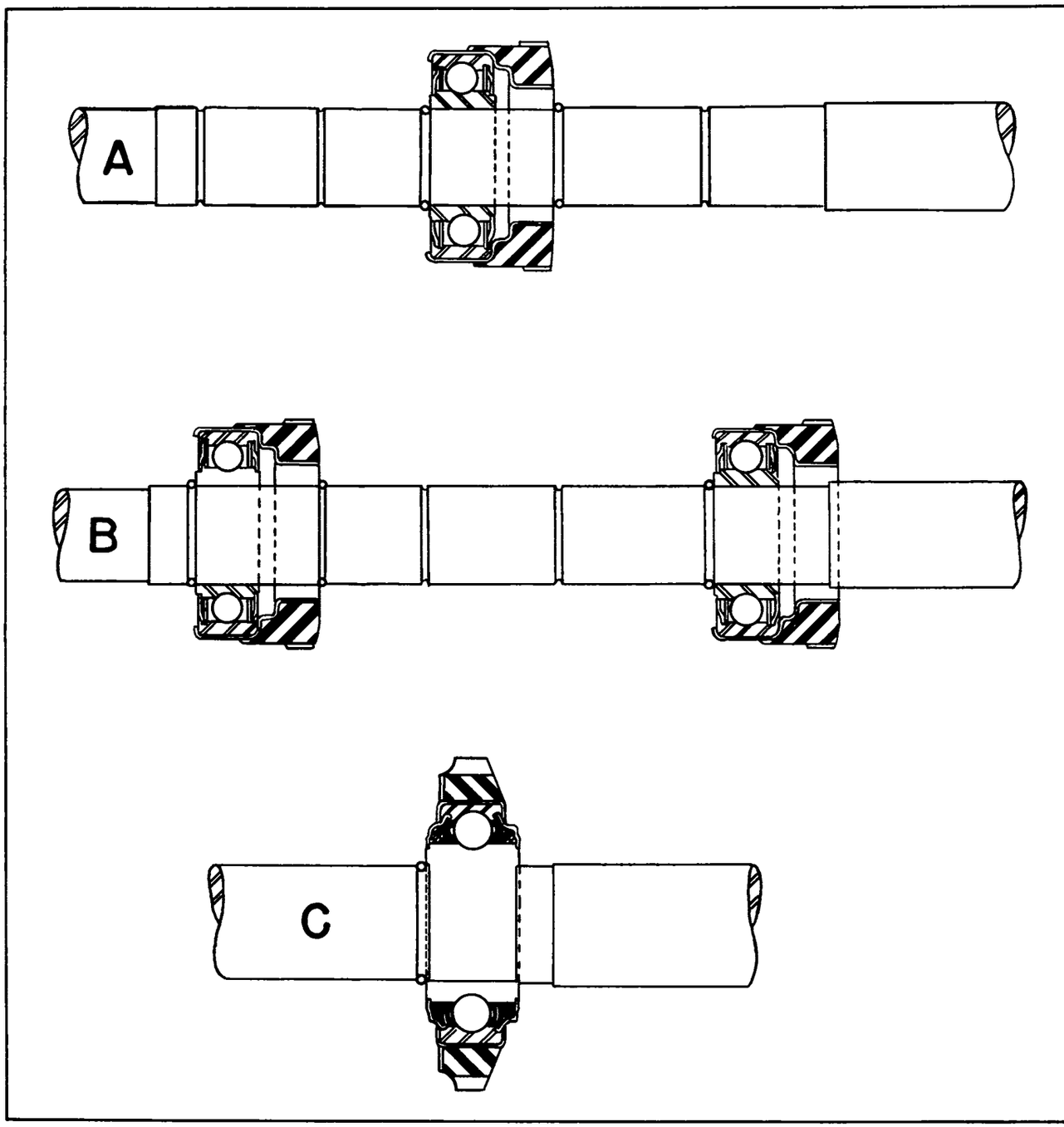


FIGURE 59—*(A) "Statesman" Series Propeller Shaft Center Bearing With 4.1:1 (8:35) Rear Axle Ratio. (B) "Statesman" Series Propeller Shaft Center Bearing With 4.9:1 (8:39) Rear Axle Ratio. (C) "Ambassador" Series Propeller Shaft Center Bearing.*

to the front of the shaft. The bearing is replaced from the front of the shaft and driven to the rear.

TRUSS RODS

"Statesman" Series

In assembling the torque tube to rear axle truss rods, both rods should be tightened uniformly at the front bracket, and locked in place so that the torque tube is in proper alignment with the rear axle.

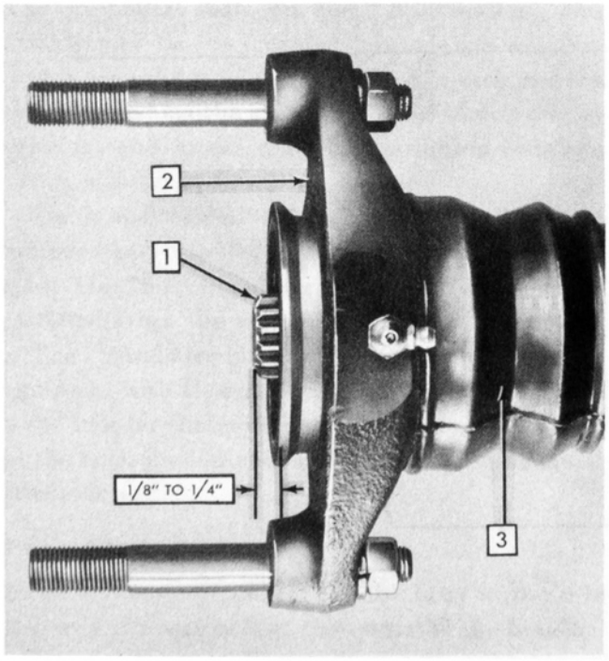
TORQUE TUBE TRUNNION BRACKET

"Statesman" Series

The front of the torque tube has a coarse pitch thread on which the trunnion bracket operates.

This bracket is slotted on the underside and is provided with an adjustable clamp screw. This clamp screw should be drawn up tight enough to remove excess clearance without setting up friction. The trunnion bracket must be free to move on the tube.

When the rear end of the propeller shaft is against the pinion shaft and the torque tube is secured to the axle housing, the front end of the propeller shaft must protrude from ⅛ to ¼ inch beyond the front face of the trunion bracket as shown in Figure 60. A projection of less than ⅛ inch may cause contact between the universal joint slinger and the bracket. More than ¼ inch will make the slinger ineffective.



1. Propeller Shaft
2. Trunnion Bracket
3. Rubber Boot

FIGURE 60—*Trunnion Bracket Adjustment.*

Lubricate sparingly every 5,000 miles using pressure lubricant. A rubber boot is provided to protect the threaded section against road dirt (Fig. 60).

REAR AXLE TRACK BAR (STABILIZER)

"Ambassador" and "Statesman" Series

The function of the rear axle track bar (stabilizer) is to maintain vertical alignment between the rear axle and the body, irrespective of the spring movements (Fig. 61).

Always check the connection at the rear axle and body bracket. Looseness at these points can produce a shimmy or road tramp.

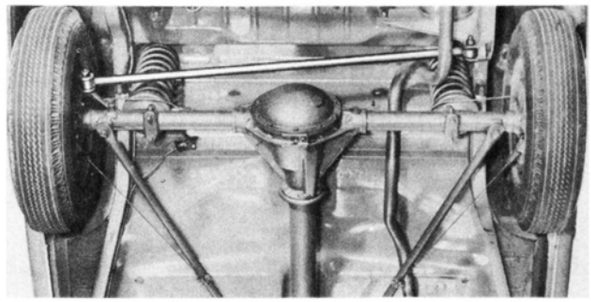


FIGURE 61—*Rear Axle Track Bar "Ambassador" Series.*

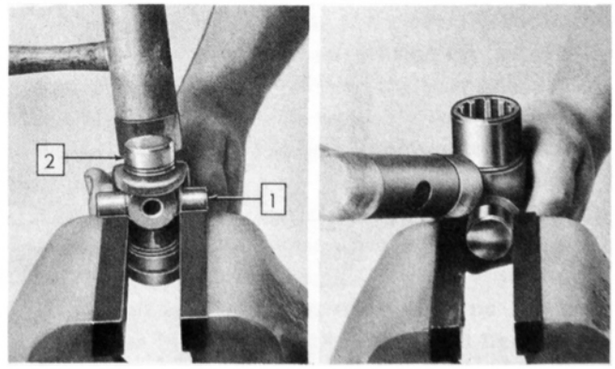
UNIVERSAL JOINTS

Universal Joint Disassembly

The four end bearings, or roller retainers are held in yoke ends by snap rings.

The snap rings are removed by securing the joint in a vise and using a hammer and punch.

After the snap rings have been removed, the assembly should be placed on parallels or in a vise as shown in Figure 62, with the trunnions of the cross resting on the parallels or vise jaws. By striking the suspended yoke with a soft hammer, the yoke member will be driven down to a point where it contacts



1. Trunnions
2. End Bearings

FIGURE 62—*Removing End Bearing From the Yoke.*

the cross. This will leave the end bearing protruding.

Carefully clamp the projecting end bearing in a vise, and then strike the yoke member with a soft hammer until the bearings are completely released as shown in Figure 62. The end bearings should be a tight press fit in the yoke.

Universal Joint Assembly

Install cross in yoke and partially assemble end bearings with new cork seal washers in place. Rest one of the end bearings on a flat plate as shown in Figure 63, and drive on the other end bearing with a soft hammer.

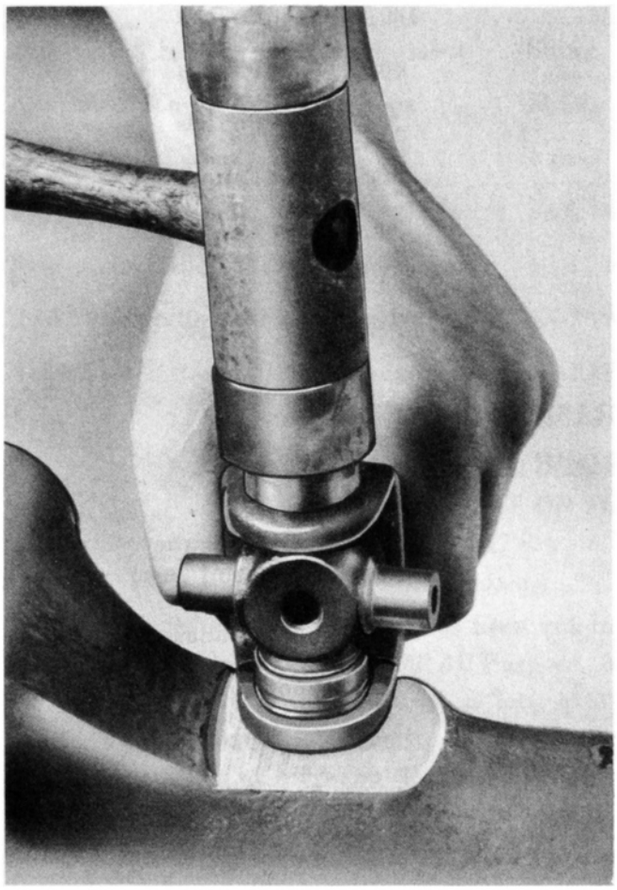
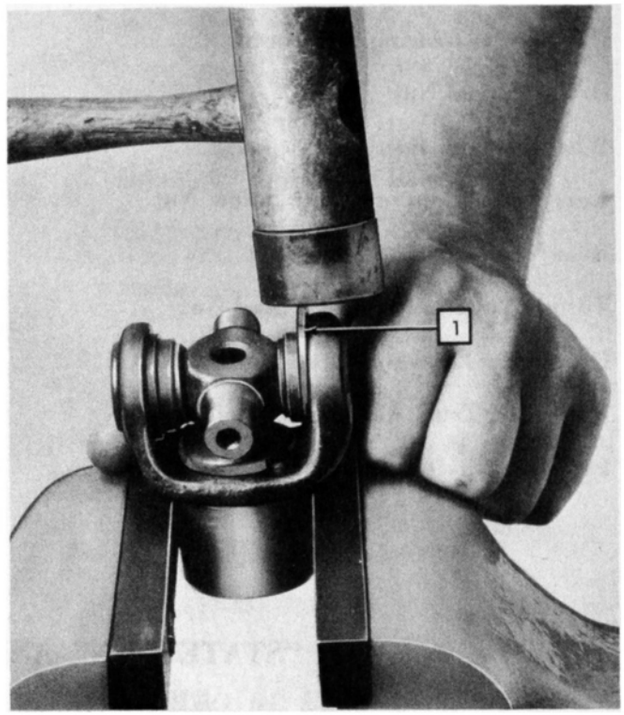


FIGURE 63—*Assembling End Bearings to Yoke.*

When both end bearings are approximately flush with the outside of the yoke, the snap rings are installed.

Always use new snap rings and make sure that they are securely seated in the grooves of the end bearings. After both snap rings are in place, support the cross in a vise as shown in Figure 64, and tap



1. Snap Rings

FIGURE 64—*Installing Snap Rings.*

yoke lightly with a soft hammer so that the snap rings are seated against the inside surface of the yoke.

LUBRICATION

The universal joint bearings are lubricated at time of assembly for the normal life of the part. However, to prolong satisfactory service, they should be disassembled, inspected, and lubricated at 15,000 mile intervals, using a semi-fluid lubricant.

"AMBASSADOR" SERIES
REAR AXLE TORQUE CHART

Description	Recommended Torque (All Parts Clean and Dry)
Ring Gear to Case Screw	50-55 Foot Pounds
Differential Bearing Cap Screw	105-110 Foot Pounds
Drive Pinion Nut	100-135 Foot Pounds
Wheel to Hub Bolt	70-80 Foot Pounds
Rear Brake Support Plate Screw Nut	50-55 Foot Pounds
Rear Wheel Hub to Shaft Nut	180-190 Foot Pounds
Torque Tube to Rear Axle Stud Nut	40-45 Foot Pounds
Rear Axle Truss Rod Stud Nut (Front)	70-80 Foot Pounds
Rear Axle Truss Rod Stud Nut (Rear)	50-55 Foot Pounds
Propeller Shaft Coupling Flange Screw Nut	30-35 Foot Pounds

"STATESMAN" AND "RAMBLER" SERIES
REAR AXLE TORQUE CHART

Description	Recommended Torque (All Parts Clean and Dry)
Ring Gear to Case Screw	45-50 Foot Pounds
Differential Bearing Cap Screw	55-60 Foot Pounds
Propeller Shaft Coupling Nut	250-300 Foot Pounds
Rear Axle Drive Pinion Nut	90-95 Foot Pounds
Rear Brake Support Plate Screw Nut	30-35 Foot Pounds
Rear Hub to Shaft Nut	160-165 Foot Pounds
Wheel to Hub Nut	70-80 Foot Pounds
Rear Spring Clip Nut (Rambler)	45-50 Foot Pounds
Rear Spring Front Eye Bushing Bolt Nut (Rambler)	35-40 Foot Pounds
Rear Axle Truss Rod Stud Nut	50-60 Foot Pounds
Rear Axle Truss Rod Nut (Rear)	20-25 Foot Pounds
Rear Axle Truss Rod Bracket Clamp Nut	35-40 Foot Pounds
Rear Axle Truss Rod Nut (Front)	20-25 Foot Pounds
Torque Tube to Rear Axle Stud Nut	40-45 Foot Pounds

REAR AXLE AND PROPELLER SHAFT SECTION

SPECIFICATIONS FOR NASH REAR AXLES

	"Ambassador" Series	"Statesman" Series	"Rambler" Series
Type	Semi-Floating	Semi-Floating	Semi-Floating
Drive Gear Type	Hypoid	Hypoid	Hypoid
Ring Gear and Pinion Backlash	.002"—.006"	.002"—.006"	.002"—.006"
Axle Shaft End Play	.002"—.004"	.002"—.004"	.002"—.004"
Pinion Shaft Bearing Tension	15" lbs.—18" lbs.	12" lbs.—14" lbs.	12" lbs.—14" lbs.
Pinion Bearing Adjustment	Shims	Shims	Shims
Differential Side Bearing Pre-Load	.004"—.006"	.004"—.006"	.004"—.006"
Differential Side Bearing Adjustment	Shims	Shims	Shims
Axle Shaft End Play Adjustment	Shims	Shims	Shims
Lubrication Capacity	4 pts.	3 pts.	3 pts.
Type of Lubricant	SAE 90 HYPOID*	SAE 90 HYPOID*	SAE 90 HYPOID*
Rear Axle Ratio (Standard)	4.1-1 (10-41)	4.4-1 (8-35)	3.8-1 (9-34)
Rear Axle Ratio (With Overdrive)	4.4-1 (9-40)	4.9-1 (8-39)	4.4-1 (8-35)
Rear Axle Ratio (With Automatic)	3.2-1 (13-41)	3.3-1 (13-43)	

*NOTE: *HYPOID REAR AXLE LUBRICANT IS TO BE USED IN ALL NEW ASSEMBLIES OR FOLLOWING THE INSTALLATION OF REPLACEMENT PARTS.*

After the rear axle has been run-in, or at the recommended drain and re-fill period, an SAE #90 All-Purpose, Multi-Purpose, or other brand designation lubricant may be used as long as it is suitable for Hypoid Rear Axle Service. Naturally, the results of such use are the responsibility of the lubricant supplier or servicing dealer.

TECHNICAL SERVICE LETTER REFERENCE

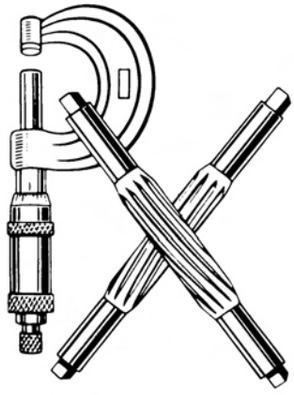
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TECHNICAL SERVICE LETTER REFERENCE

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TECHNICAL SERVICE MANUAL



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FRONT AXLE—
FRONT SUSPENSION—
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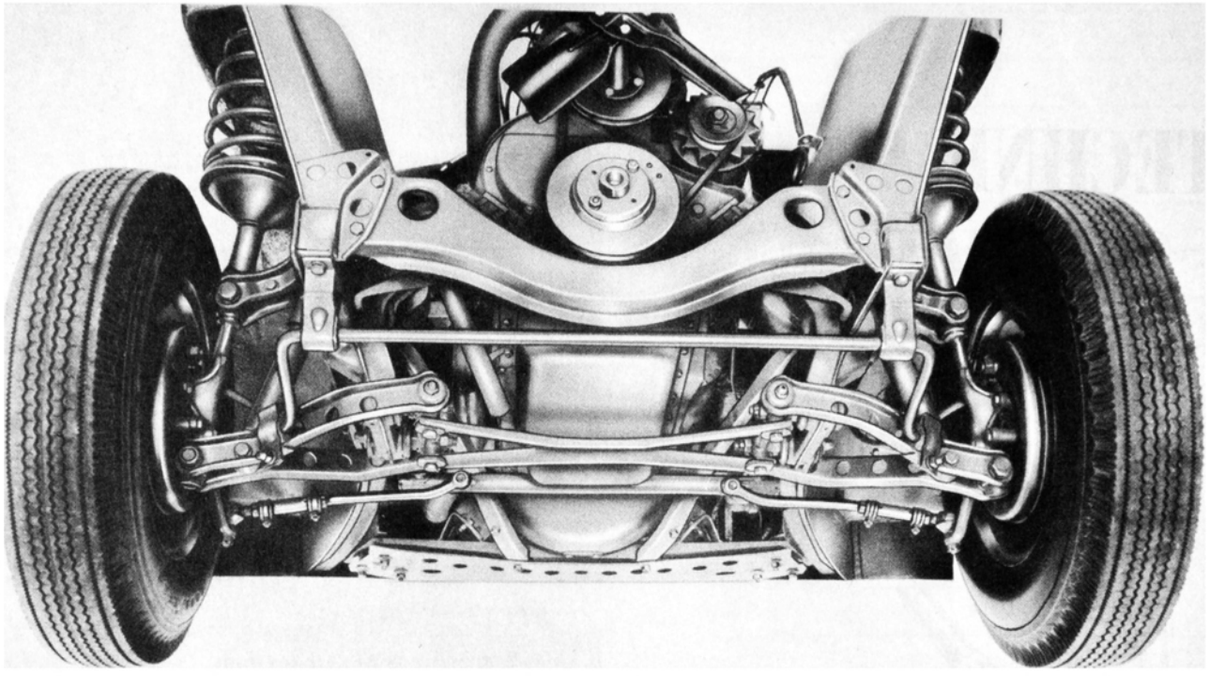


FIGURE 1—*Front Suspension Assembly "Ambassador" Series Shown.*

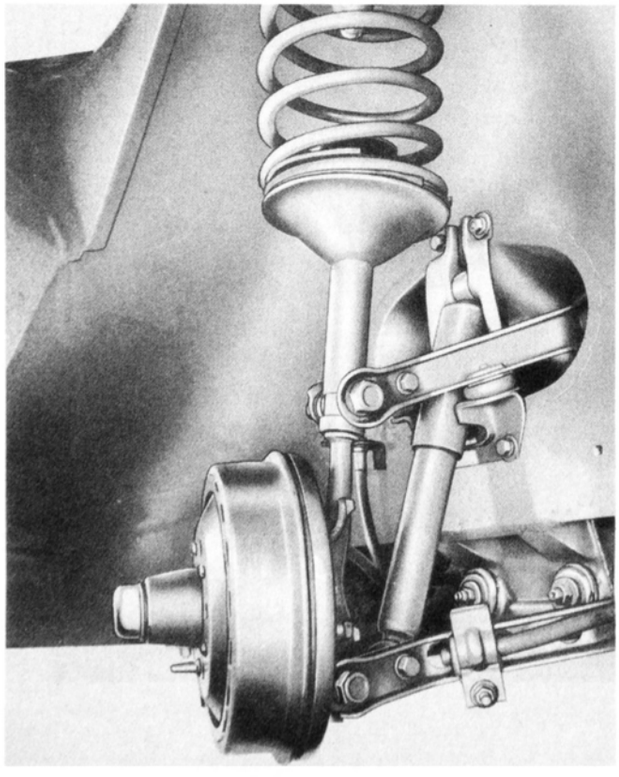


FIGURE 2—*Front Suspension Assembly (Right Side) "Ambassador" and "Statesman" Series.*

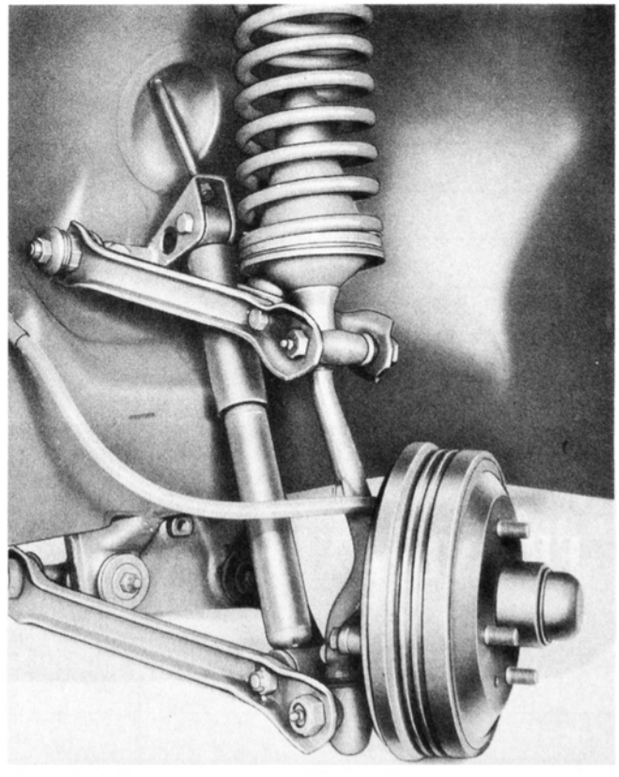


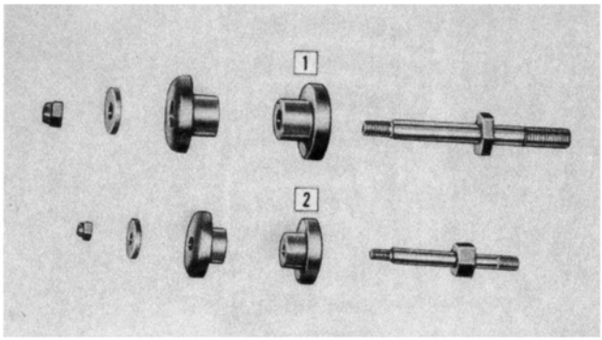
FIGURE 3—*Front Suspension (Right Side) "Rambler" Series.*

FRONT SUSPENSION

The front suspension is an independent linked parallelogram type. The left and right assemblies can be removed and overhauled individually.

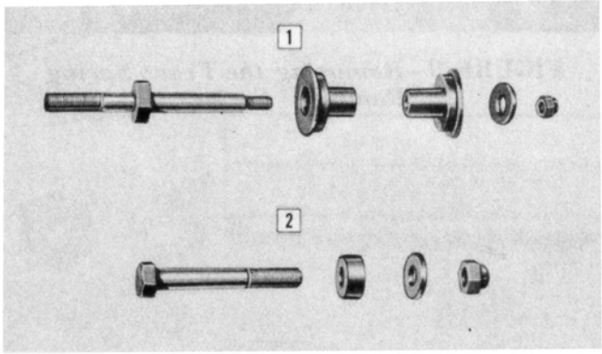
The front coil springs are located between the upper ends of the steering knuckle pins and a seat in the outer wheelhouse panel (Figs. 2 and 3).

The front suspension assemblies are attached to the mounting brackets with special shoulder bolts. The upper and lower bolts on the "Ambassador" and "Statesman" Series (Fig. 4), and the lower bolts on the "Rambler" Series (Fig. 5) are rubber insulated.



1. Lower Control Arm Pivot Bar to Body Mounting Assembly
2. Upped Control Arm Pivot Bar to Body Mounting Assembly

FIGURE 4—*Front Suspension Mounting Assembly "Ambassador" and "Statesman" Series.*



1. Lower Control Arm Pivot Bar to Body Mounting Assembly
2. Upper Control Arm Pivot Bar to Body Mounting Assembly

FIGURE 5—*Front Suspension Mounting Assembly "Rambler" Series.*

STABILIZER BAR

"Ambassador" Series

A front stabilizer bar is used on the "Ambassador" Series only. Due to the greater weight of these cars, the bar is required to provide complete control of body roll.

FRONT COIL SPRING

Removing the Front Spring

The front coil spring may be removed using *two* front coil spring compressors, J-5224 for the "Ambassador" and "Statesman" Series, and KMO-735 "Rambler" Series.

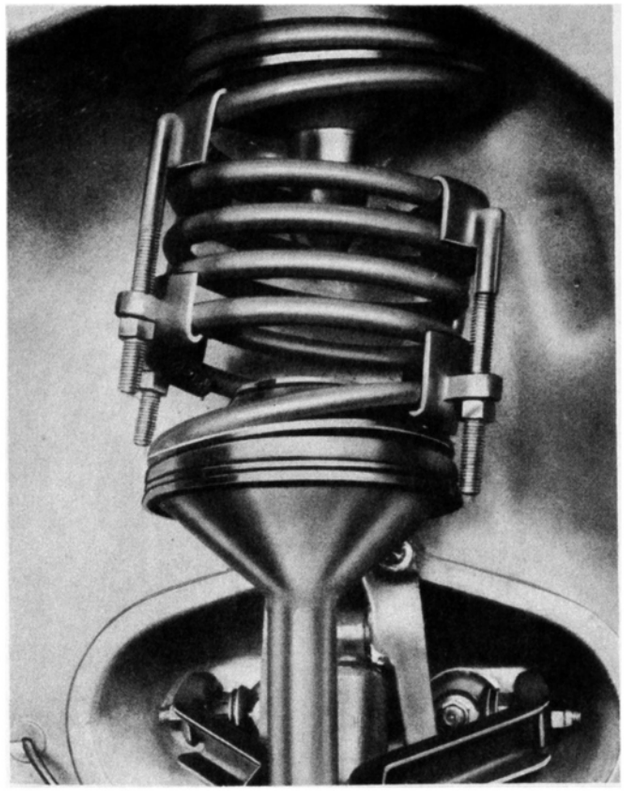


FIGURE 6—*Front Spring Compressors Installed on the "Ambassador" and "Statesman" Series.*

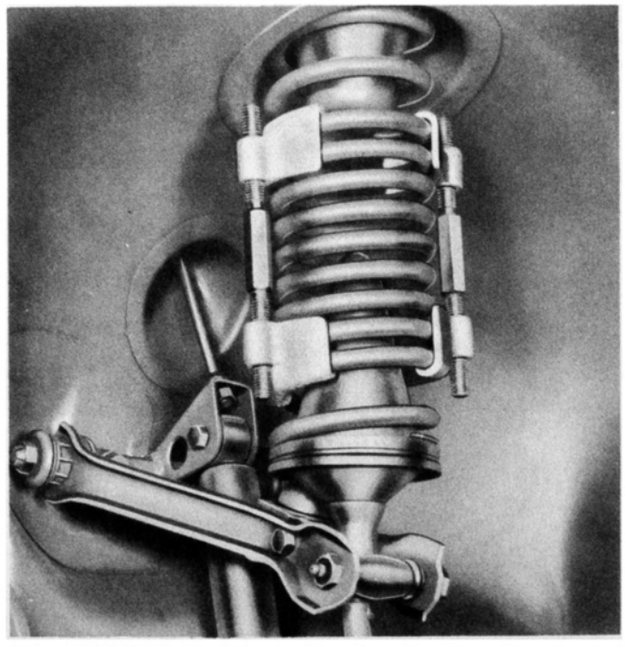


FIGURE 7—*Front Spring Compressors Installed on the "Rambler" Series.*

Attach one end of each spring compressor to the spring. Partially compress the spring by raising the opposite rear end of the car.

NOTE: *It is not necessary to partially compress the front spring on the "Rambler" Series when using spring compressors KMO-735.*

Complete the installation of the spring compressors, enclosing five coils on the "Ambassador" and "Statesman" Series, and nine coils on the "Rambler" Series (Figs. 6 and 7).

Remove the rebound bumpers from the upper control arms to provide additional clearance for spring removal.

Lower the rear of the car and remove the spring (Figs. 8 and 9).

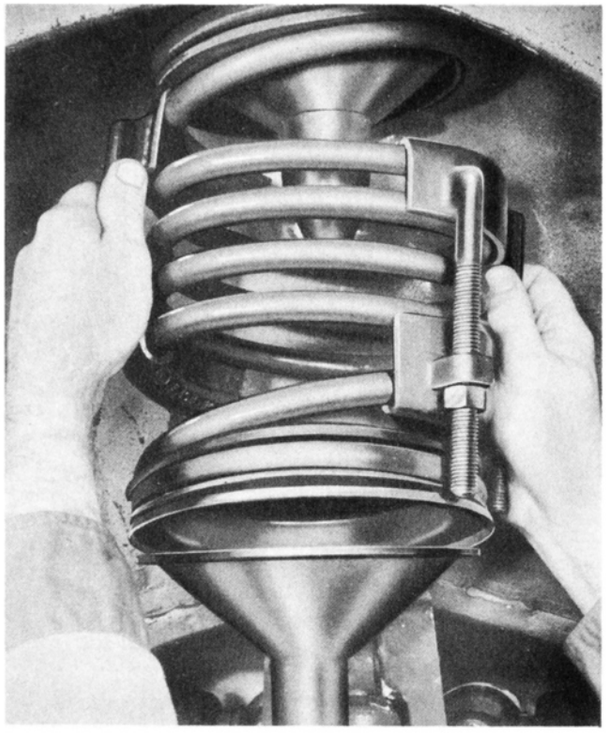


FIGURE 8—*Removing the Front Spring "Ambassador" and "Statesman" Series.*

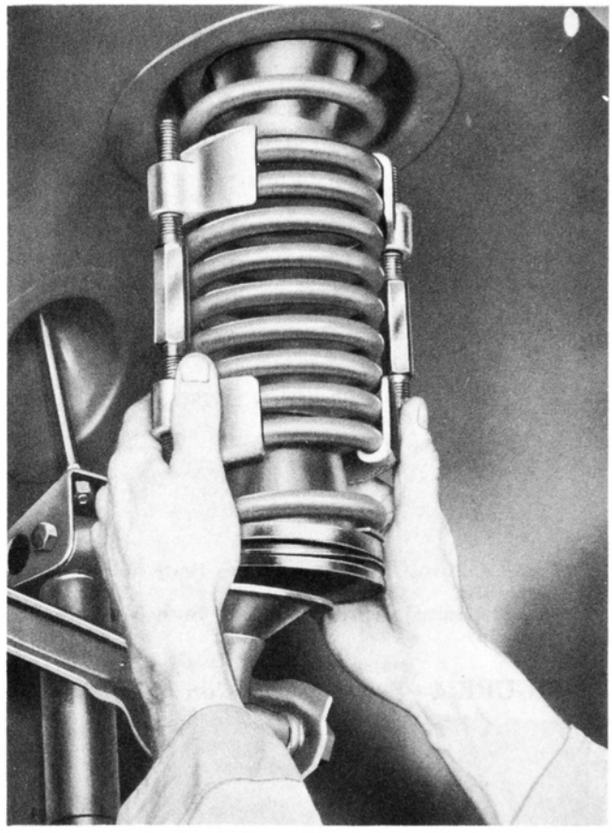


FIGURE 9—*Removing the Front Spring "Rambler" Series.*

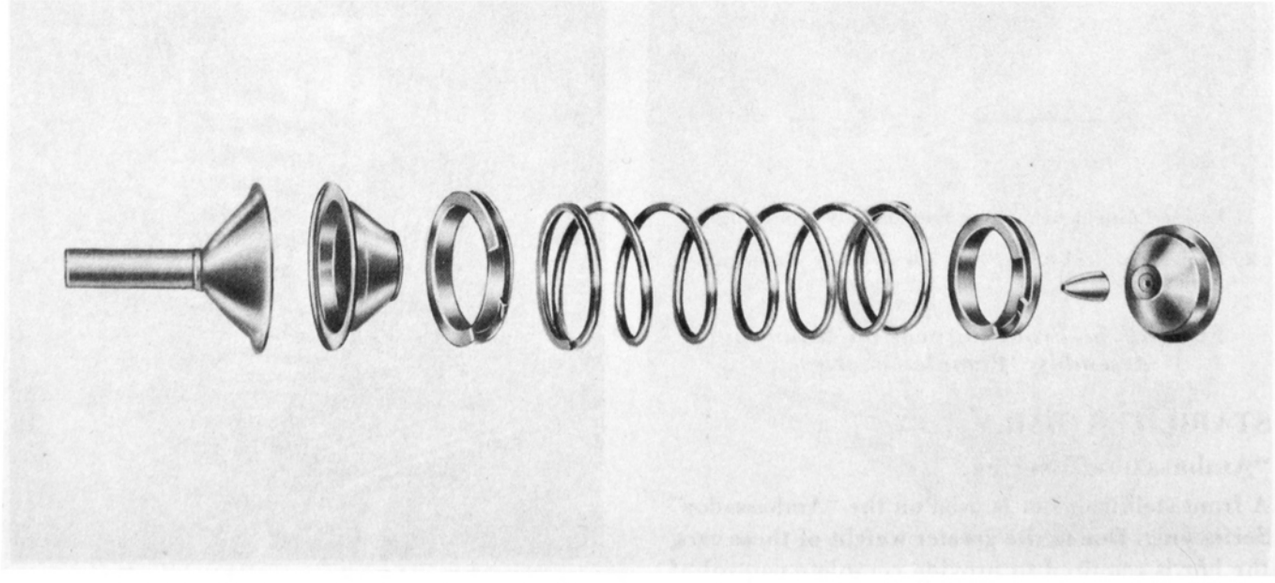


FIGURE 10—*Front Spring Assembly Sequence "Ambassador" and "Statesman" Series.*

Two "Ambassador" Series lower spring seats and a 5/8" bolt or threaded rod 18" long may be used to facilitate the installation or removal of the spring compressors, when a new spring is to be installed (Figs. 12, 13, and 14).

Installing the Front Spring

Install spring compressor tools J-5229 for the "Ambassador" and "Statesman" Series and KMO-735 "Rambler" Series.

Assemble the spring cushions and spring seats on the spring, and install the spring on the steering knuckle pin.

CAUTION: *The lip of lower spring seat must engage upper end of knuckle pin to prevent the spring from slipping off the pin.*

Compress the spring in the same manner as used for removing the spring and remove the compressor tools.

UPPER AND LOWER CONTROL ARMS

The upper and lower control arms are attached to the pivot bars by means of rubber insulated bushings.

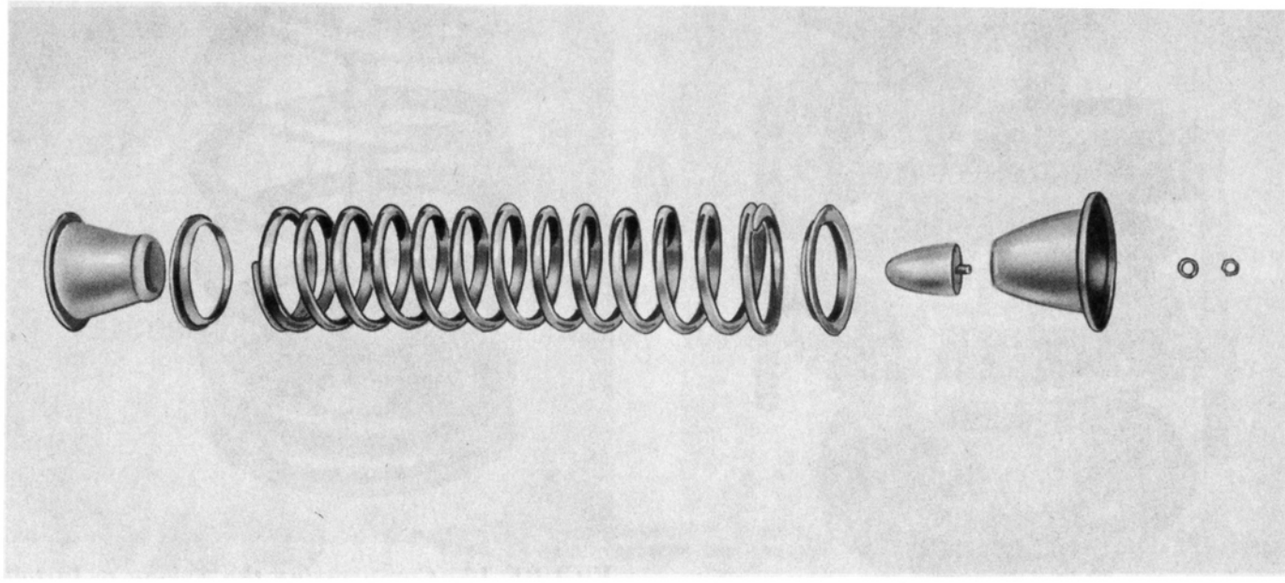


FIGURE 11—*Front Spring Assembly Sequence "Rambler" Series.*

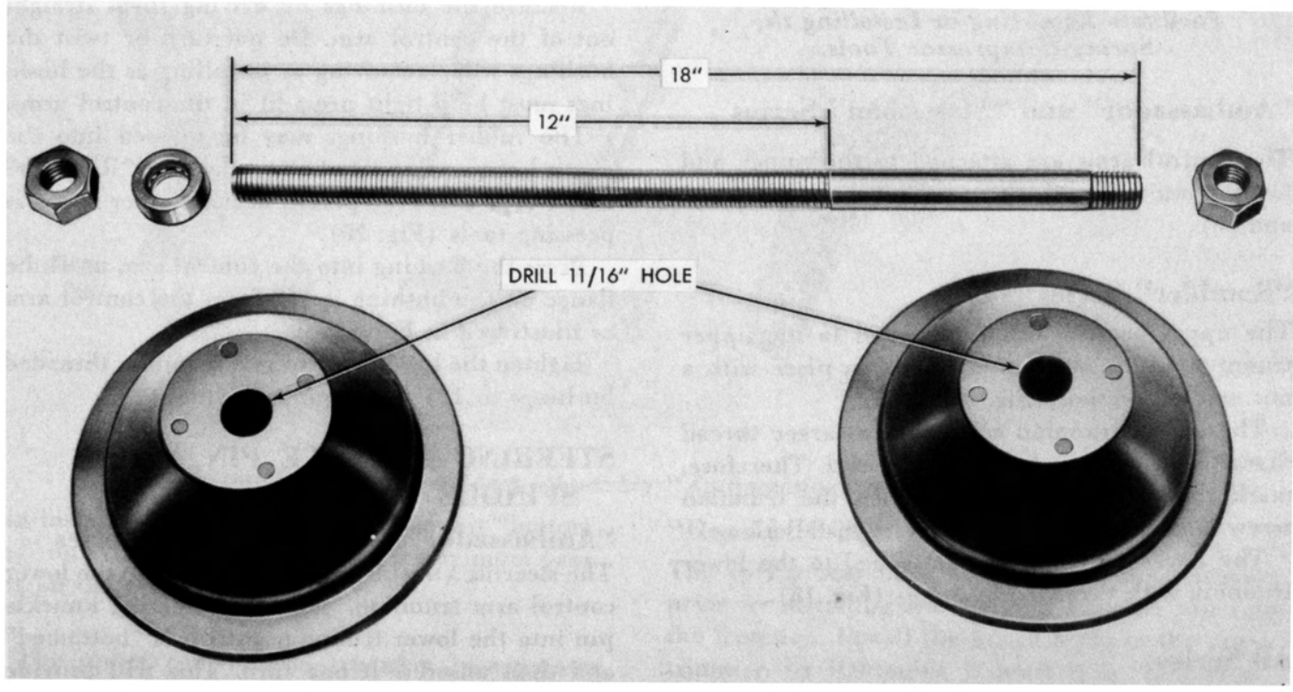


FIGURE 12—*A Spring Compressing Tool may be Fabricated From Two Lower Spring Seats and a 5/8" Bolt or Threaded Rod 18" Long.*

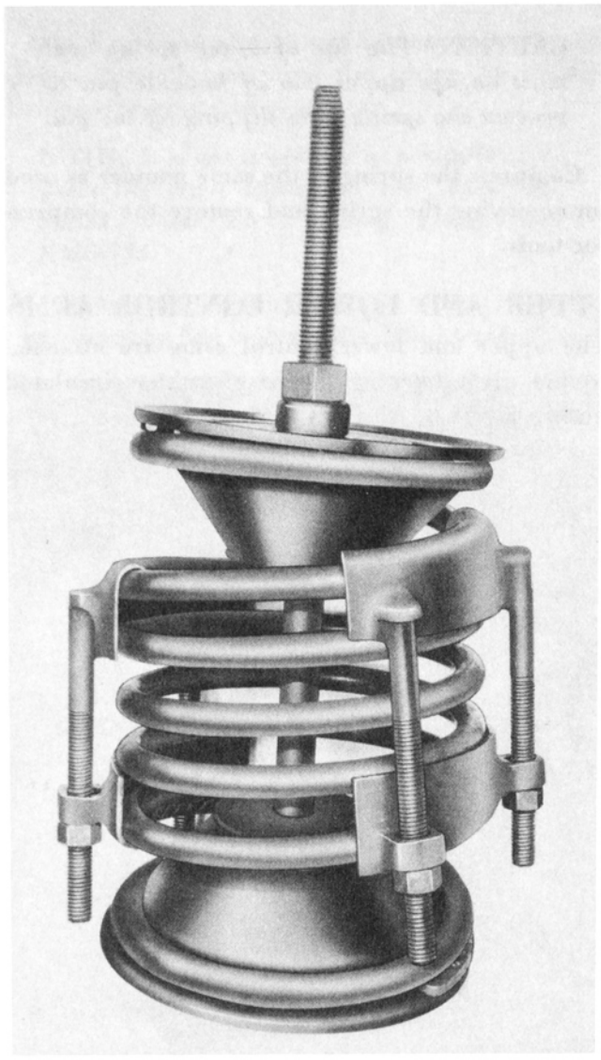


FIGURE 13—*Spring Partially Compressed to Facilitate Removing or Installing the Spring Compressor Tools.*

"Ambassador" and "Statesman" Series

The control arms are attached to the upper and lower trunnions with threaded bushings (Figs. 15 and 16).

"Rambler" Series

The upper control arm is attached to the upper trunnion with a screw and locked in place with a nut and lockwasher (Fig. 17).

The upper trunnion screw has a larger thread diameter at the head than at the end. Therefore, mark the control arm from which the trunnion screw is removed to insure correct installation.

The lower control arm is attached to the lower trunnion with threaded bushings (Fig. 18).

All Series

The rubber bushings (Harris type) are pressed into the control arms as illustrated in Figure 19.

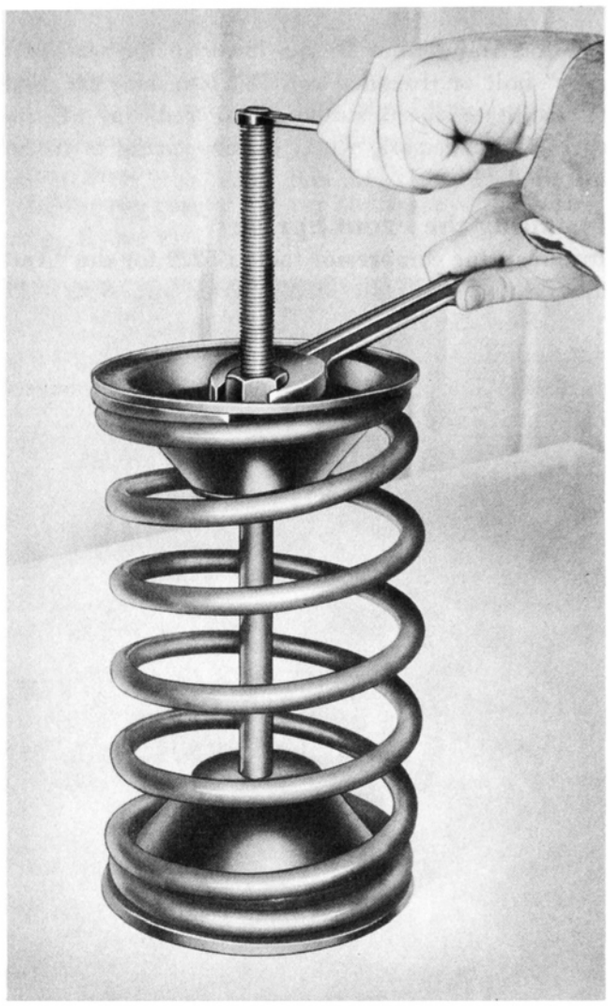


FIGURE 14—*Compressing the Spring to Install the Spring Compressors.*

Remove the bushings by driving them straight out of the control arm. Do not turn or twist the bushings when removing or installing as the bushings must be a tight press fit in the control arms.

The rubber bushings may be pressed into the control arms using two "Statesman" or "Rambler" Series rear axle rear pinion bearing inner cones as pressing tools (Fig. 20).

Press the bushing into the control arm until the flange on the bushing is ½" from the control arm as illustrated in Figure 19.

Tighten the lower control arm trunnion threaded bushings to 125 foot pounds torque.

STEERING KNUCKLE PIN AND SPINDLE

"Ambassador" and "Statesman" Series

The steering knuckle pin is threaded into the lower control arm trunnion. Screw the steering knuckle pin into the lower trunnion until it is "bottomed" and then unscrew it one turn. This will provide approximately ¼" clearance between the shoulder on the knuckle pin and the trunnion. The knuckle

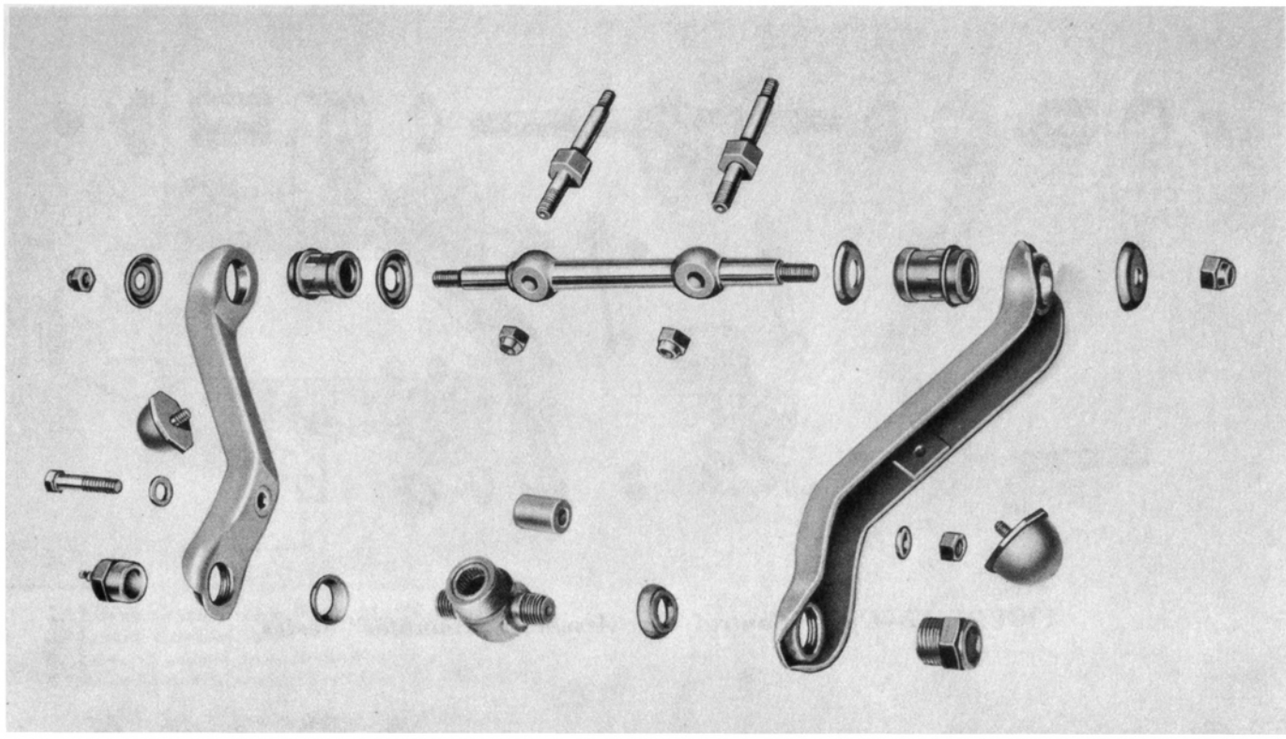


FIGURE 15—*Upper Control Arm Assembly "Ambassador" and "Statesman" Series.*

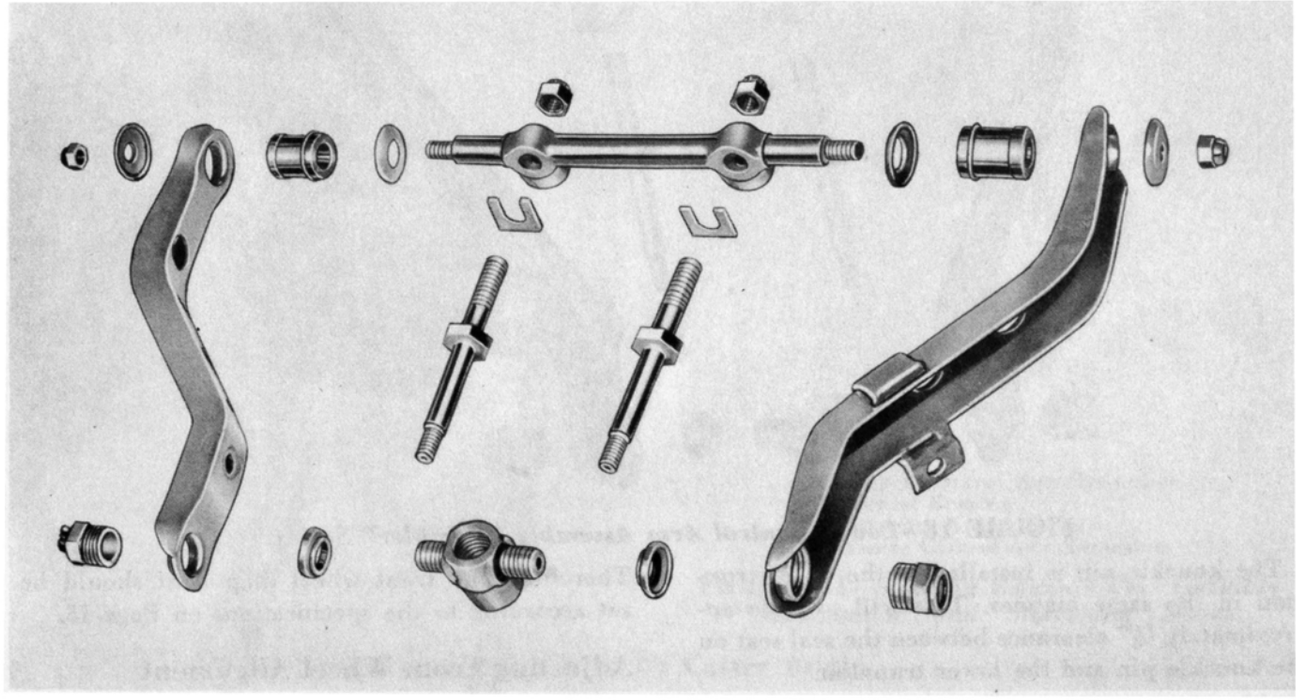


FIGURE 16—*Lower Control Arm Assembly "Ambassador" and "Statesman" Series.*

pin installed in this manner will prevent "bottoming" on extreme turns and insure a maximum bearing on the thread area.

The upper control arm trunnion incorporates needle bearings and a thrust bearing which are retained by a castellated nut (Fig. 21).

"Rambler" Series

The spring seat must be bolted to the trunnion prior to installing the steering knuckle pin into the trunnion. Install the knuckle pin in the upper trunnion by tightening it until it is "bottomed." Then loosen one complete turn to prevent "bottoming" on extreme turns (Fig. 22).

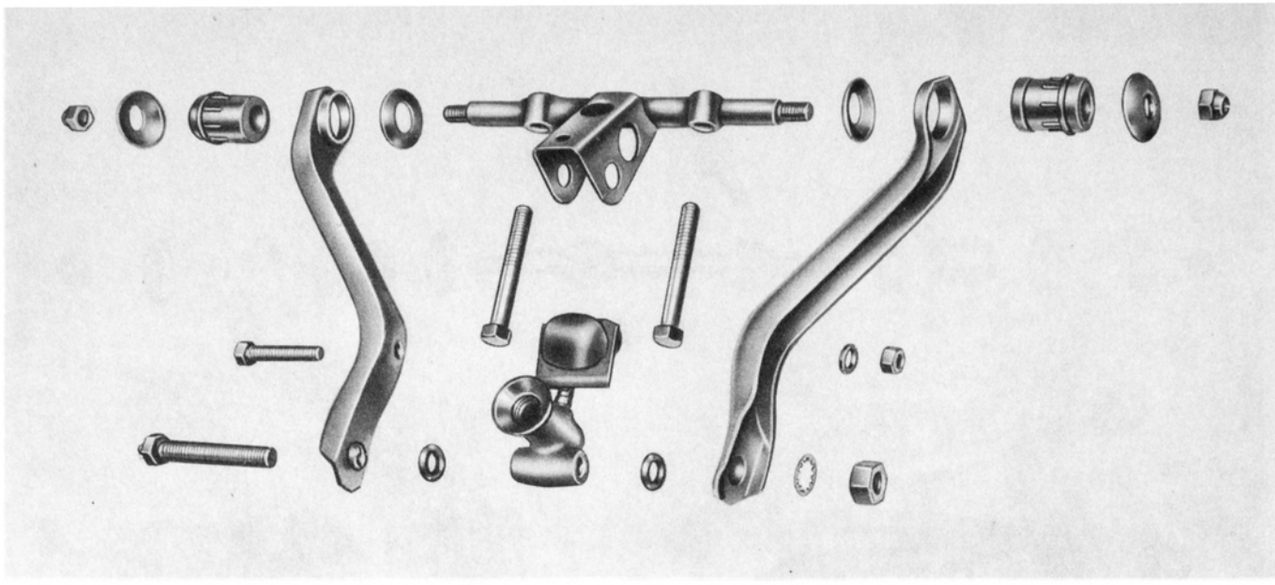


FIGURE 17—*Upper Control Arm Assembly "Rambler" Series.*

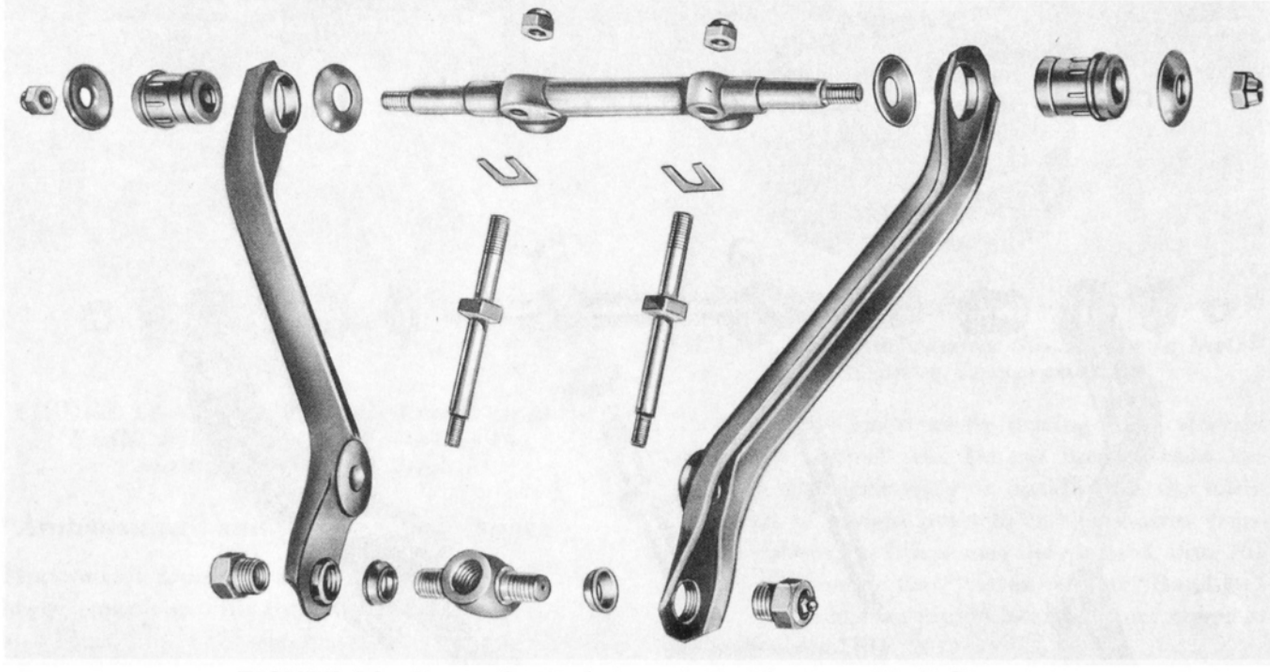


FIGURE 18—*Lower Control Arm Assembly "Rambler" Series.*

The knuckle pin is installed in the lower trunnion in the same manner. This will provide approximately ¼" clearance between the seal seat on the knuckle pin and the lower trunnion.

STEERING ARMS

The steering arms are designed to provide the correct toe-in for the straight ahead position, and the correct turning angle (or toe-out) for turns.

Incorrect toe-in on straight ahead or toe-out on turns is in many cases due to bent steering arms.

FRONT WHEEL ALIGNMENT

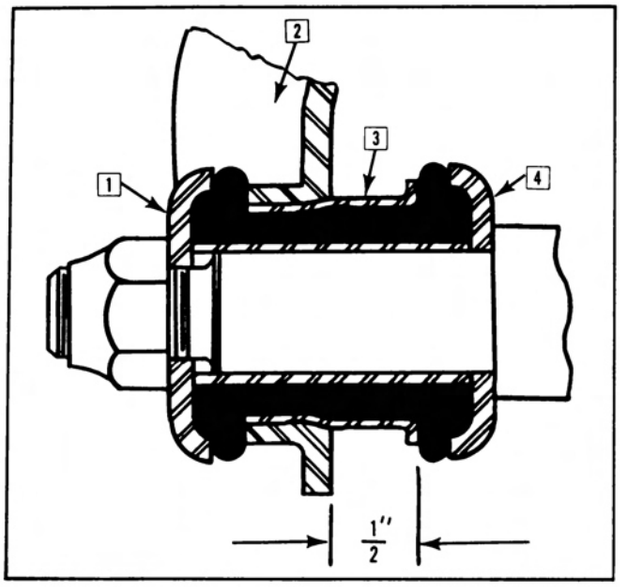
Hard steering and abnormal tire wear is usually the result of incorrect front wheel alignment. Therefore, the front wheel alignment should be set according to the specifications on Page 15.

Adjusting Front Wheel Alignment

"C" type washers are used to "adjust" the front wheel alignment. The washers are installed between the lower control arm pivot bar and the front suspension mounting bracket (Fig. 23).

NOTE: *Loosen the front suspension brace prior to making caster or camber adjustments.*

Caster and camber gauge J-1377 is used to check the caster and camber adjustments (Fig. 24).



1. Lower Control Arm Pivot Bar Washer—Outer
2. Lower Control Arm
3. Lower Control Arm Pivot Bar Bushing
4. Lower Control Arm Pivot Bar Washer—Inner

FIGURE 19—*Bushing Installed in Control Arm.*

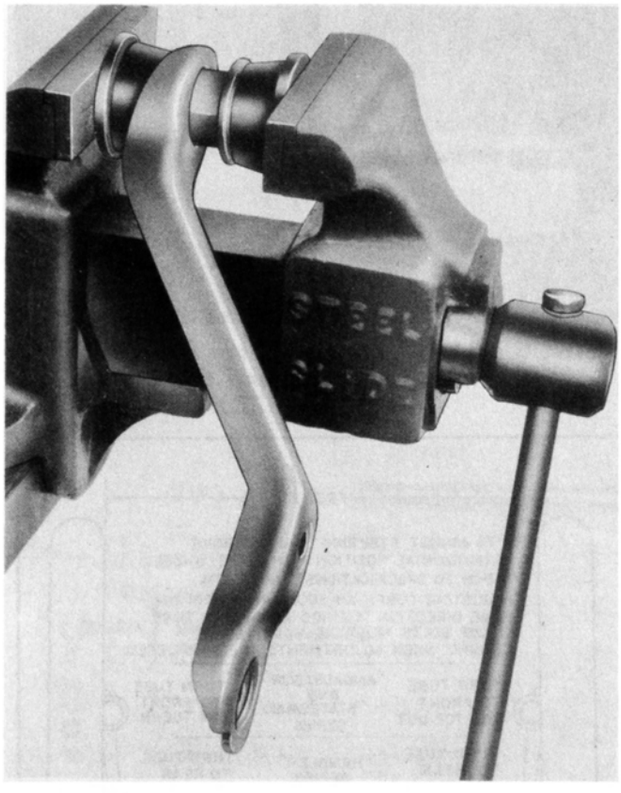
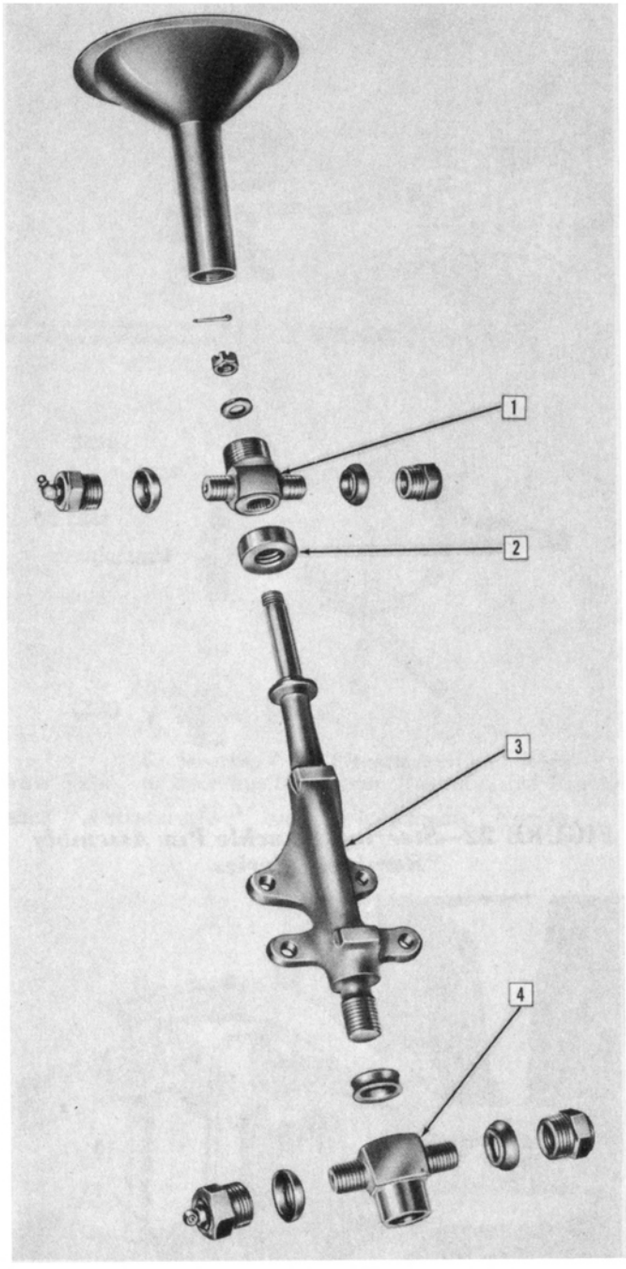


FIGURE 20—*Pressing the Bushing Into the Control Arm.*

CAUTION: *Be sure that the gauge points on the steering knuckle are clean before using the gauge, and that the gauge is tight against the gauge points when the reading is taken.*



1. Upper Control Arm Trunnion
2. Thrust Bearing
3. Steering Knuckle Pin
4. Lower Control Arm Trunnion

FIGURE 21—*Steering Knuckle Pin Assembly "Ambassador" and "Statesman" Series.*

Caster Angle

Place the gauge against the gauge points provided on the steering knuckle and read the caster angle on the caster scale of the gauge.

Adjust the caster angle by loosening the lower control arm pivot bar attaching screw nuts, and inserting "C" washers between the lower control arm and the front suspension mounting bracket. Adding "C" washers at point "A" will increase the caster angle; adding washers at point "B" will decrease caster.

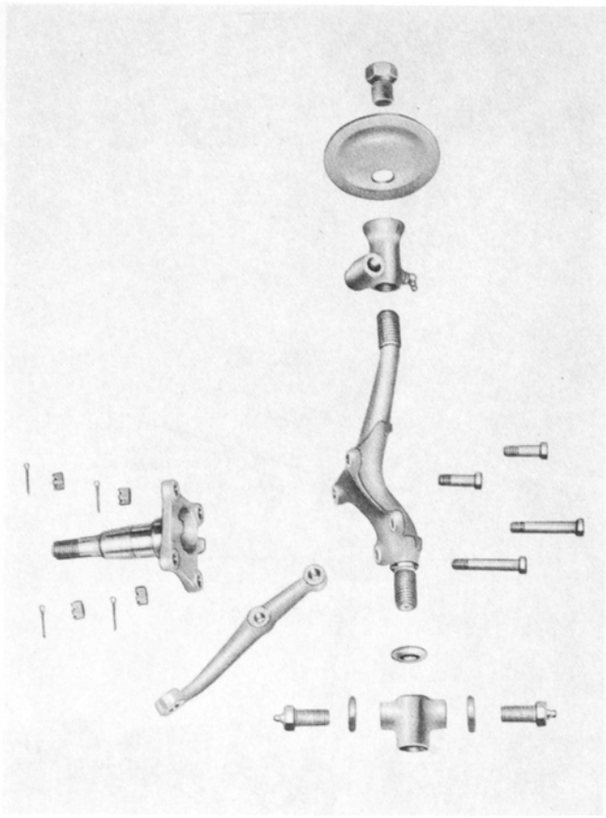


FIGURE 22—*Steering Knuckle Pin Assembly "Rambler" Series.*

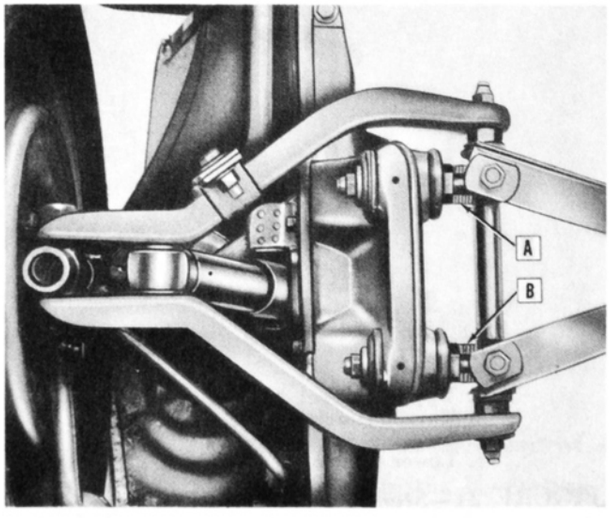


FIGURE 23—*Caster and Camber Adjustments are Made by Inserting "C" Washer at Points "A" and "B."*

Camber Angle

Check the camber angle using the caster and camber gauge, as shown in Figure 24, reading the camber scale.

Adjust camber by adding or removing an equal number of "C" washers at both points "A" and "B"; adding washers will increase the camber angle; removing "C" washers will decrease camber.

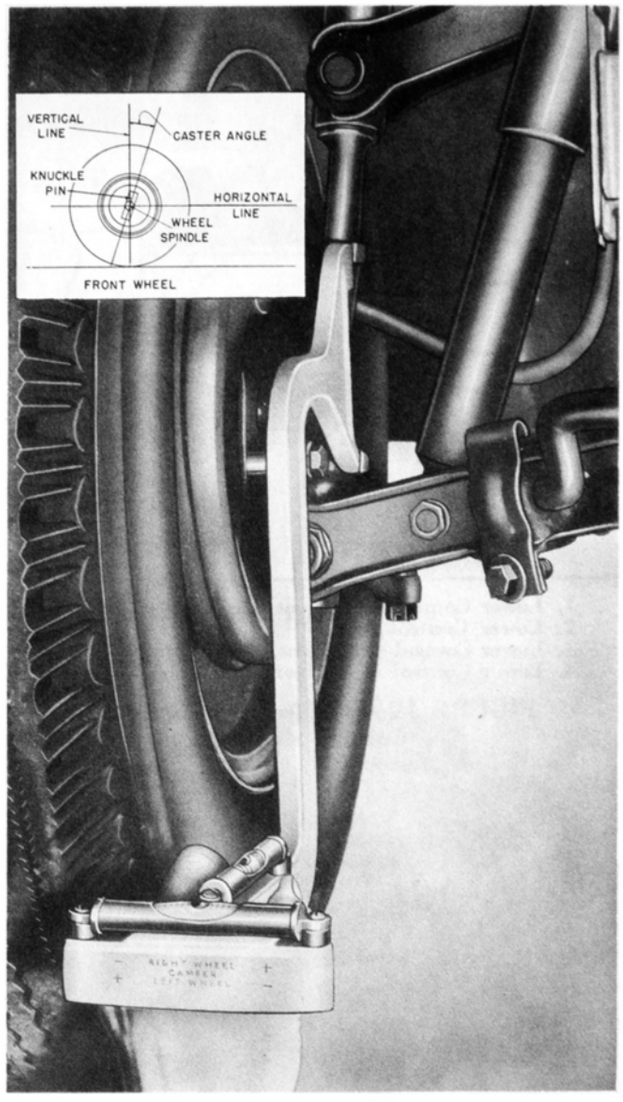


FIGURE 24—*Gauge Points are Provided for use with the Caster and Camber Gauge (J-1377).*

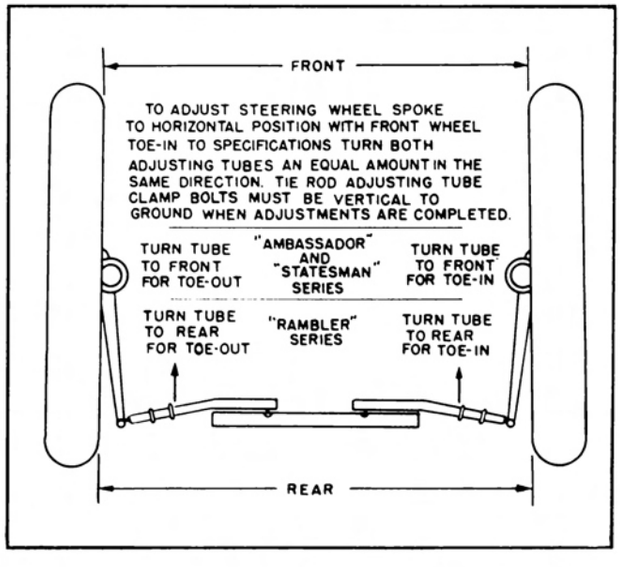
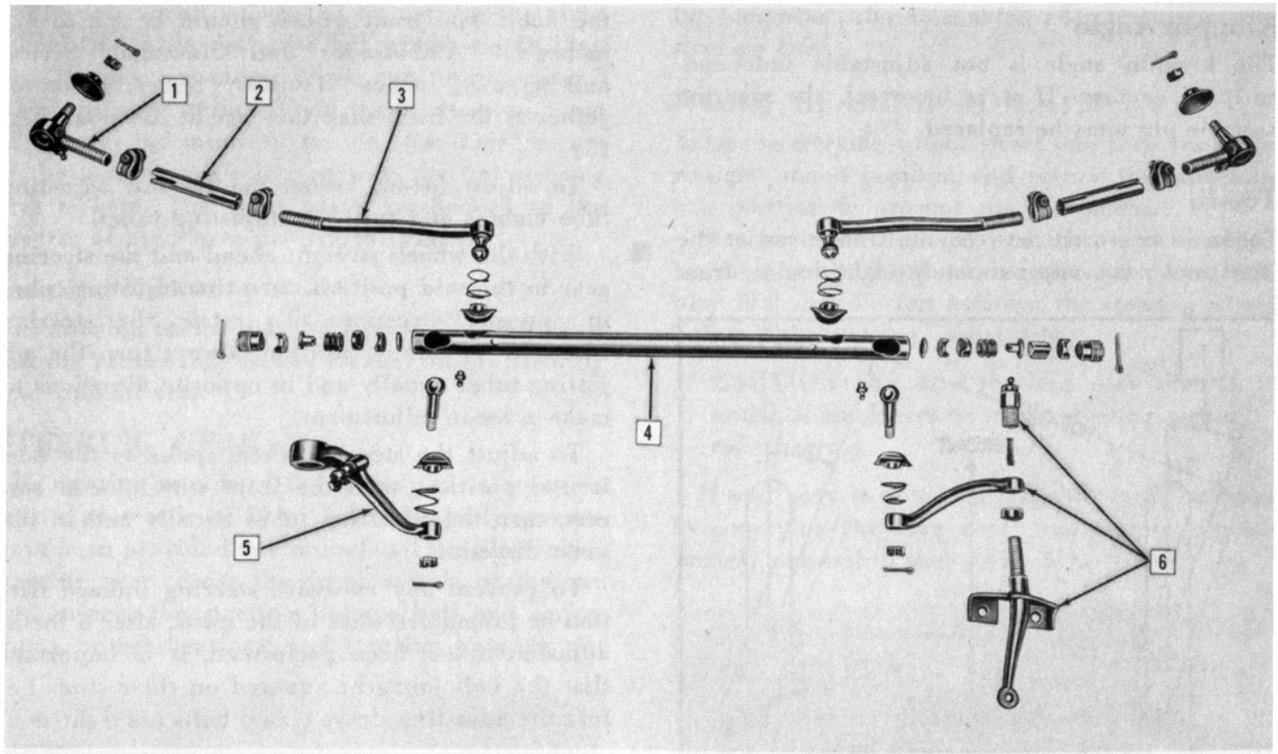
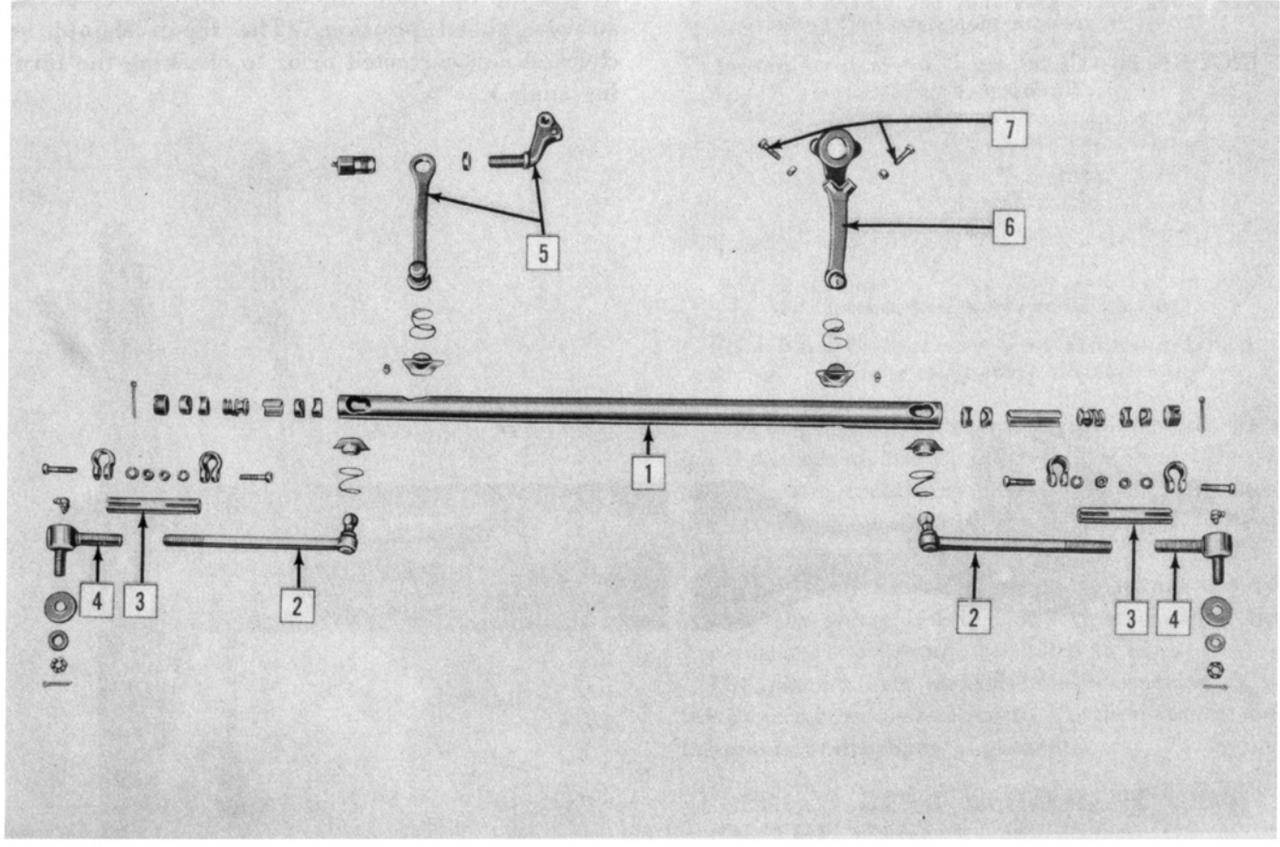


FIGURE 25—*Toe-In Setting.*



1. Steering Tie Rod End
2. Steering Tie Rod Adjusting Tube
3. Steering Tie Rod
4. Steering Linkage Cross Tube
5. Steering Gear Pitman Arm and Stops
6. Steering Idler Arm, Bushing, and Bracket

FIGURE 26—*Steering Linkage Assembly Sequence "Ambassador" and "Statesman" Series.*



1. Steering Linkage Cross Tube
2. Steering Tie Rod
3. Steering Tie Rod Adjusting Tube
4. Steering Tie Rod End
5. Steering Idler Arm and Bracket
6. Steering Gear Pitman Arm
7. Steering Gear Pitman Arm Stops

FIGURE 27—*Steering Linkage Assembly Sequence "Rambler" Series.*

Kingpin Angle

The kingpin angle is not adjustable independently of camber. If it is incorrect, the steering knuckle pin must be replaced.

Toe-In

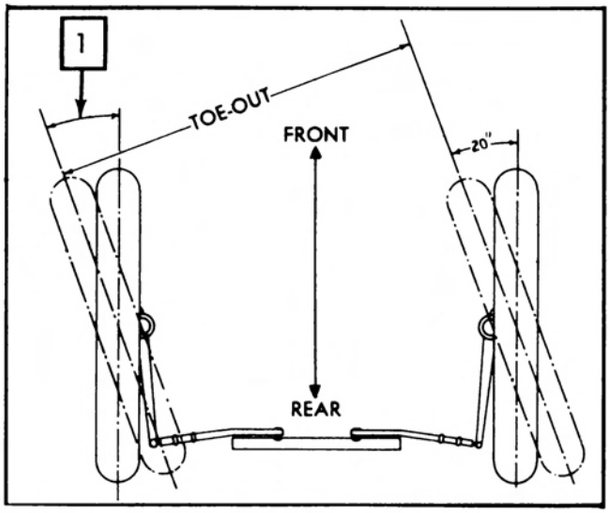
Toe-in is measured between the front tires, at the front and rear, approximately eight inches from the floor. The front wheels should be 1/16 to 3/16 inches for "Ambassador" and "Statesman" Series, and 1/8 to 1/4 inches "Rambler" Series, closer together at the front than they are at the rear (Fig. 25).

To adjust toe-in, loosen the tie rod adjusting tube clamps and turn the adjusting tubes.

With the wheels straight ahead and the steering gear in the mid position, turn the adjusting tubes in opposite directions. To retain the steering wheel in its correct position, always turn the adjusting tubes equally and in opposite directions to make a toe-in adjustment.

To adjust the steering wheel spoke to the horizontal position, with the front wheel toe-in correct, turn the adjusting tubes equally and in the same direction.

To prevent any excessive steering linkage friction or premature wear of the parts, after a toe-in adjustment has been performed, it is important that the ball joints be squared on their studs before the adjusting sleeve clamp bolts are tightened.



1. 23 Deegrees for the "Ambassador" Series
   23½ Degrees for the "Statesman" Series
   22½ Degrees for the "Rambler" Series

FIGURE 28—*Checking Wheels for Correct Turning Angle.*

Turning Angle

The turning angle (toe-out on turns) is checked by placing the front wheels on turn tables in the straight ahead position. (The toe-in should be checked and corrected prior to checking the turning angle.)

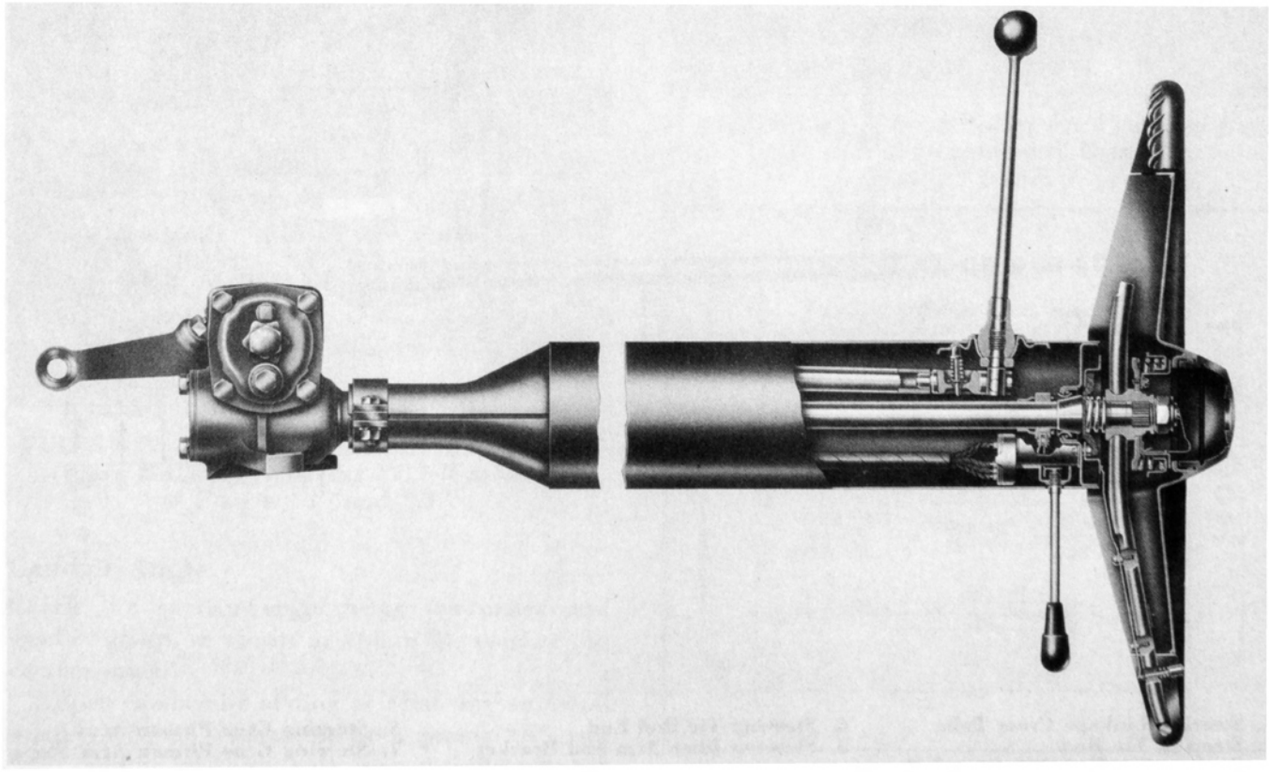


FIGURE 29—*"Ambassador" Series Steering Gear Cross Section.*

The left wheel is checked by turning the right wheel 20° to the left; the left wheel should then be 23° plus ½° minus 0° on the "Ambassador," 23½° plus ½° minus 0° on the "Statesman," and 22½° plus ½° minus 0° on the "Rambler" Series. If the turning angle is incorrect, the left steering arm is bent. The right wheel is checked in the reverse of the above procedure (Fig. 28).

Turning Radius

The turning radius may be adjusted by means of turning radius stop screws located on the steering gear pitman arm.

STEERING GEAR

The steering gear is of the worm and roller type, with a gear ratio of 20 to 1. External adjustments have been provided to eliminate all the play in the steering gear. Raise the front wheels of the car and inspect the steering linkage ball and socket joints, wheel bearings, and steering knuckle pin for looseness prior to making adjustments on the steering gear.

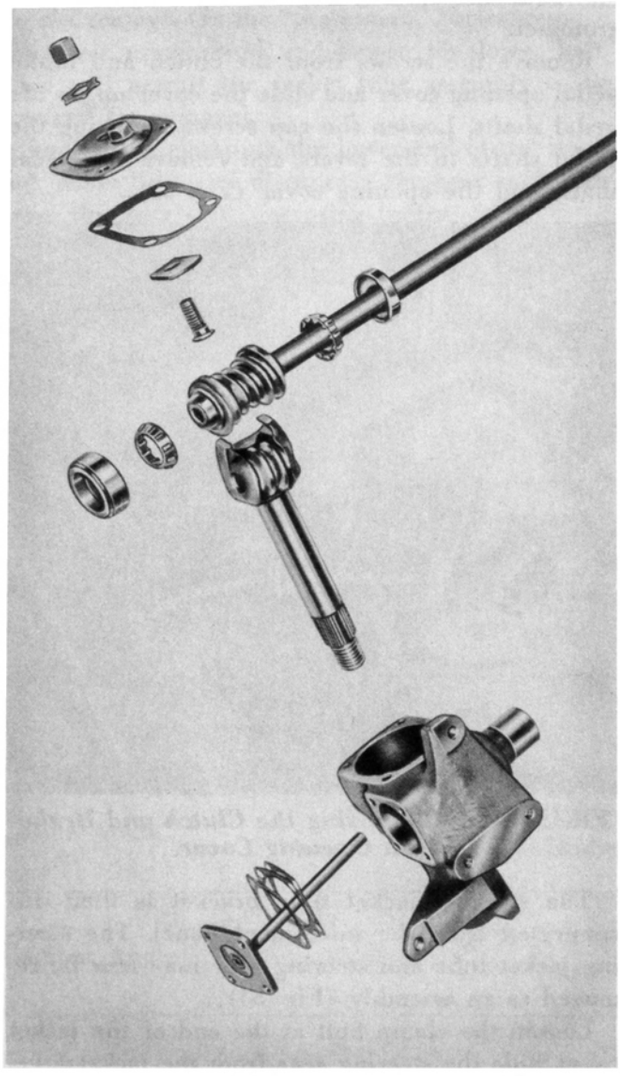


FIGURE 30—*Steering Gear Assembly (Statesman Series Shown)*

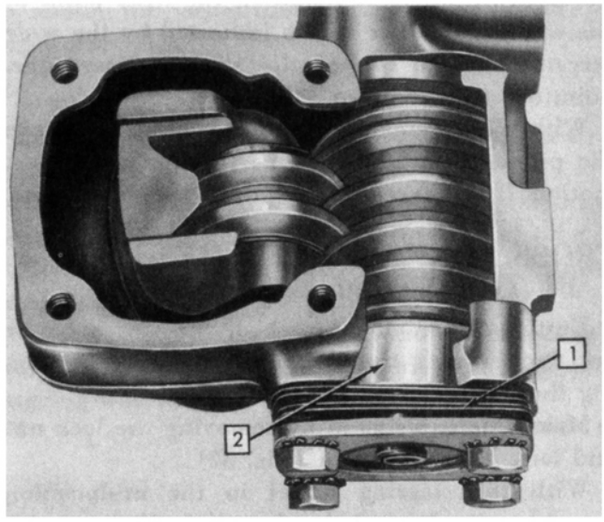
WORM BEARING ADJUSTMENT

Turn the steering wheel about one turn from the straight ahead position and secure the wheel in this position to prevent any movement.

Steering worm bearing end play is determined by shaking the front wheel sideways noting end play that may be felt between the steering wheel hub and the steering jacket tube.

CAUTION: *Be sure the end play that is noted, is not looseness in the steering jacket tube bearing.*

If end play is noted, adjust the worm bearings by loosening the four cover cap screws approximately one-eighth inch (Fig. 31).



1. Shims
2. Steering gear worm roller bearing

FIGURE 31—*Steering Gear Housing Lower Cover Adjusting Shims.*

Separate the top shim using a knife blade, passing the blade all the way around the shims. Do not mutilate the remaining shims or gasket. Remove the top shim, reassemble, and reinspect for end play.

Remove only one shim at a time to prevent adjusting the worm bearings too tight, causing the steering gear to become too hard to turn.

The pitman arm should be disconnected from the steering linkage to insure further correct adjustments and proper alignment.

STEERING GEAR ALIGNMENT IN THE CAR

Loosen the mounting bolts just enough to allow the gear to shift on the frame and line up at the angle determined by the height setting of the

jacket tube bracket. Then retighten the frame bracket bolts. Loosen the jacket tube bracket, allow it to shift to match the gear column position, and retighten.

The steering gear alignment should be inspected and corrected prior to inspecting the cross shaft roller and worm mesh.

INSPECTION FOR THE PROPER MESH OF THE CROSS SHAFT ROLLER IN THE WORM

Turn the steering wheel to the midposition of its complete travel or turning limits. (Drag link previously disconnected.)

When the steering wheel is in the midposition the two spokes should be an equal distance from a horizontal position, and the steering gear will be on the high point of the worm and roller. If the steering wheel is removed, the high point of the worm and roller is also indicated by the wide serration at the top of the steering gear tube, pointing straight down.

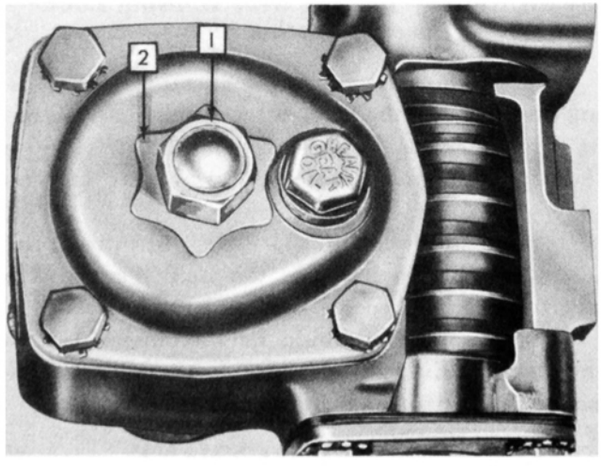
With the steering gear in the midposition, shake the pitman arm to determine the amount of lost motion. If this exceeds 1/32", adjust the roller shaft.

CROSS SHAFT ROLLER MESH IN THE WORM

Adjustments for closer mesh of the steering gear cross roller with the worm are made by tightening the outside cross shaft adjusting screw.

Make this adjustment by removing the lock nut and lock plate shown in (Fig. 32).

With the steering wheel in the midposition (straight ahead) and the drag link disconnected, tighten the adjusting screw just enough to remove the play between the cross shaft roller and worm.



1. Lock Nut
2. Lock Plate

FIGURE 32—*Remove the Lock Nut and Lock Plate to Adjust the Mesh of the Cross Shaft Roller With the Worm.*

Check the amount of play at the end of the pitman arm. DO NOT OVER-TIGHTEN.

REMOVING THE STEERING GEAR FROM THE CAR

"Ambassador" and "Statesman" Series

Remove the steering gear pitman arm from the steering gear cross shaft using a standard gear puller.

Disconnect the gear shift rods from the gear shift operating levers and the steering gear housing from the body side sill.

Remove the horn ring and horn blowing parts as an assembly. Pull the steering wheel.

Disconnect all wires, under the dash, that are attached to the steering jacket tube. Tag wires to enable correct reconnection at time of assembly.

Slide the rubber grommet up on the jacket tube, fold the floor mat toward the center of the floor, and slide the rubber insulator up to the rubber grommet.

Remove the screws from the clutch and brake pedal opening cover and slide the cover up on the pedal shafts. Loosen the cap screws attaching the pedal shafts to the levers and remove the pedal shafts and the opening cover (Fig. 33).



FIGURE 33—*Removing the Clutch and Brake Pedal Opening Cover.*

The steering jacket tube bracket is then disconnected from the instrument panel. The steering jacket tube and steering gear may now be removed as an assembly (Fig. 34).

Loosen the clamp bolt at the end of the jacket tube. Slide the steering gear from the jacket tube.

The steering gear is installed in the reverse of the above procedure.

"Rambler" Series

Remove the horn ring and horn blowing parts as an assembly and then pull the steering wheel.

Disconnect the pitman arm from the cross shaft of the steering gear and the tie rod from the left steering arm.

Drain the cooling system, and remove the radiator to water pump tube.

Loosen the clamp on the lower end of the steering jacket tube and remove the steering gear mounting bolts from the body side sill.

The steering gear can then be removed from the bottom of the car, over the lower control arm.

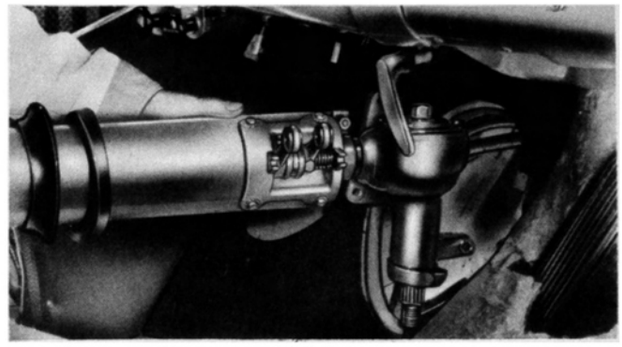


FIGURE 34—*Removing the Steering Gear From the Car.*

REMOVING THE STEERING JACKET TUBE

"Ambassador" and "Statesman" Series

On the "Ambassador" Series, remove the upper and lower front steering gear mounting bolts. Loosen the lower rear bolt about two turns but do not remove. On the "Statesman" Series, remove the three upper bolts and loosen the lower bolt. This will permit the jacket tube assembly to be lowered for removal.

Loosen the clamp on the lower end of the steering jacket tube and disconnect the gear shift rods from the gear shift operating levers.

Pull the steering wheel and disconnect all wires, under the dash, that are attached to the steering jacket tube.

Remove the clutch and brake pedal shafts and opening cover.

Then remove the steering jacket tube bracket from the instrument panel.

The steering jacket tube may now be removed by sliding the jacket tube up and off of the steering worm tube.

"Rambler" Series

Loosen the clamp on the lower end of the steering jacket tube.

Disconnect the gear shift rods and the gear shift operating housing from the steering jacket tube.

Remove the steering wheel and the jacket tube support cushion.

The steering jacket tube can now be lifted upward through the rubber dust shield and off the steering worm tube.

SPECIFICATIONS

	"Ambassador" Series	"Statesman" Series	"Rambler" Series
Turning Angle	23° + ½° — 0°	23½° + ½° — 0°	22½° + ½° — 0°
Kingpin Angle	6½°	6½°	8½°
Caster Angle	0° to ½° Pos. ½° Desired	0° to ½° Pos. ½° Desired	¾° to 1¼° Pos. 1° Desired
Camber Angle	¼° Neg. to ¼° Pos. 0° Desired	¼° Neg. to ¼° Pos. 0° Desired	¼° to ¾° Pos. ½° Desired
Toe-In	1/16" to 3/16"	1/16" to 3/16"	1/8" to ¼" ¼" Desired

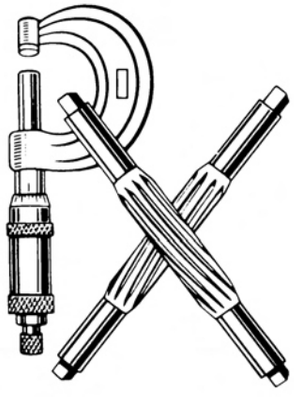
TORQUE TIGHTENING SPECIFICATIONS	"Ambassador" and "Statesman" Series	"Rambler" Series
Upper Mounting Bolt to Side Sill—Nut	35— 45	55— 60
Lower Mounting Bolt to Side Sill—Nut	55— 60	45— 50
Upper Control Arm Pivot Bar to Mounting Bolt—Nut	55— 60	
Lower Control Arm Pivot Bar to Mounting Bolt—Nut	75— 80	55— 60
Pivot Bar Bushing Retaining Nut	55— 60	55— 60
Lower Control Arm Spacer Screw Nut	90— 95	90— 95
Upper Control Arm Trunnion Screw Nut		40— 60
Front Suspension Brace Bolt	85—100	85—100
Wheel to Hub	70— 80	70— 80
Steering Wheel Nut	25— 30	25— 30
Pitman Arm Nut	75— 80	75— 80

TECHNICAL SERVICE LETTER REFERENCE

Date	Letter No.	Subject	Changes information on Page No.

Nash

TECHNICAL SERVICE MANUAL



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Front Spring Specifications 2

Rear Springs 3

Rear Spring Specifications 6

Removing the Rear Springs 3

Installing the Rear Spring Cushions 4

SHOCK ABSORBERS 6

SERVICE LETTER REFERENCE 6

RUNNING GEAR

RUNNING GEAR SECTION

SPRINGS

"Ambassador" and "Statesman" Series

Coil springs are used on the front and rear. Rubber cushions are incorporated to insulate the springs from the body and axles, thus minimizing the transmission of road noise into the car body.

"Rambler" Series

Coil springs are used in the front suspension and semi-elliptic springs in the rear. Road noise transmission is minimized by insulating the springs from the body with rubber cushions and bushings.

FRONT SPRING SPECIFICATIONS

Series	Free Height	Loaded Height	Rate Lbs. Per Inch After Loaded Weight
Ambassador	17½" to 18"	8⅝" at 1000# plus or minus 25#	115# plus or minus 5#
Statesman	17 13/16" to 18⅝"	8⅝" at 920# plus or minus 25#	100# plus or minus 5#
Rambler—Left	18"	10⅜" at 810# plus or minus 22#	110# plus or minus 4#
Rambler—Right	18"	10⅜" at 755# plus or minus 20#	110# plus or minus 4#

FRONT SPRINGS

The limits referred to above, in connection with the loaded height, are identified by one grind mark for the low limit and two grind marks for a high limit spring. These grind marks will be found on the flat section of the end coil of the spring.

Refer to the Front Suspension Section for detailed information on removing or replacing the front coil springs.

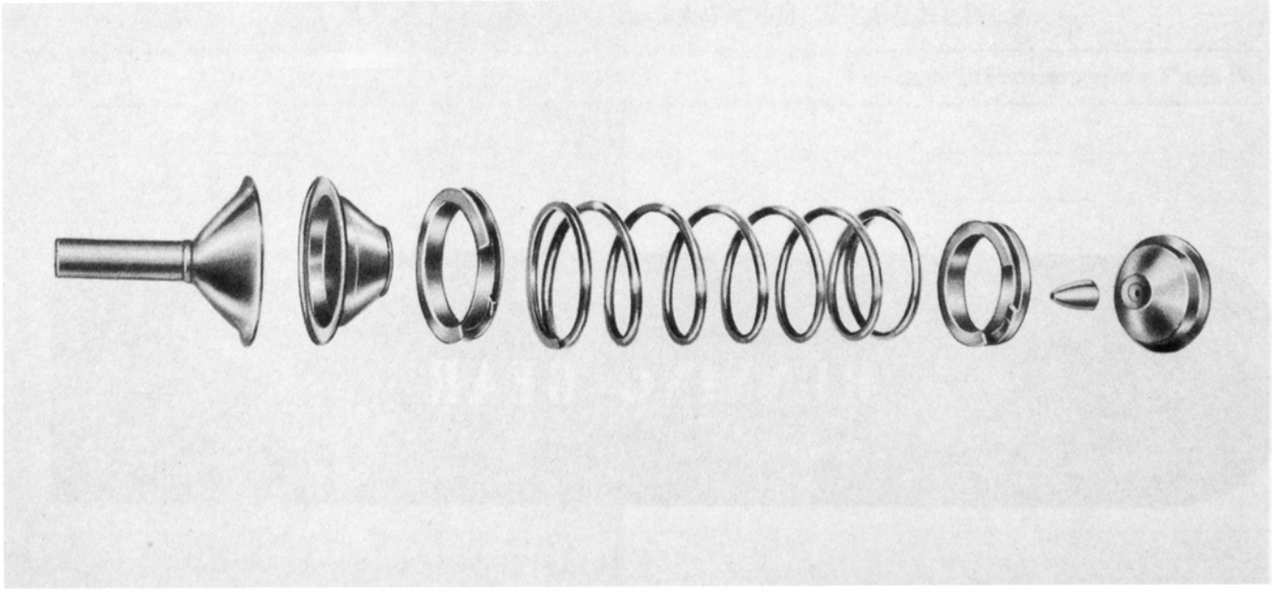


FIGURE 1—*Front Spring Assembly ("Ambassador" and "Statesman" Series).*

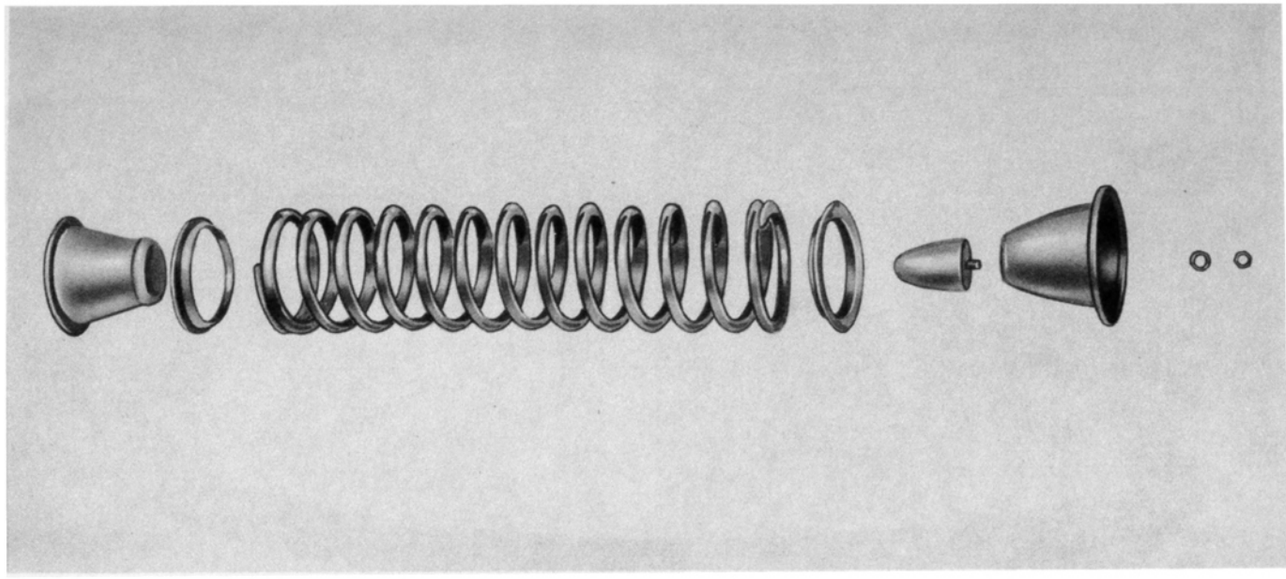


FIGURE 2—*Front Spring Assembly ("Rambler" Series).*

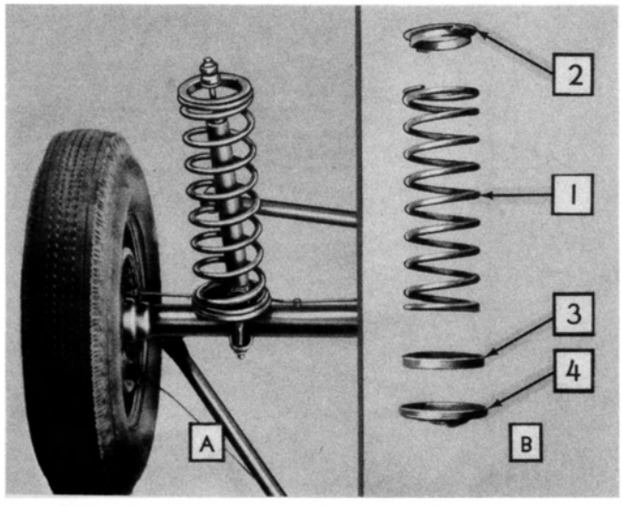
REAR SPRINGS

NOTE: *When heavy rear springs are installed, heavy shock absorbers must also be installed in both front and rear.*

REMOVING THE REAR SPRINGS

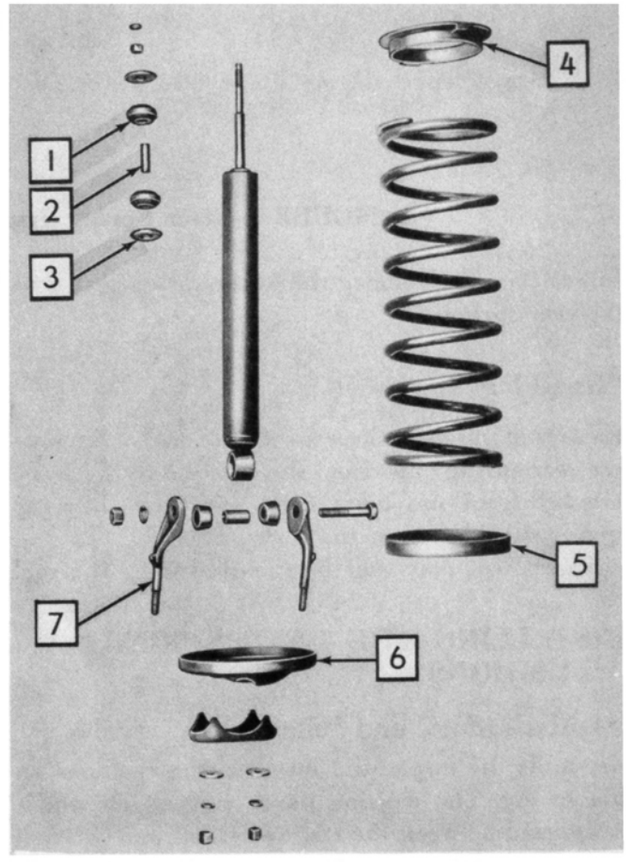
"Ambassador" and "Statesman" Series

Raise and support the rear of the body to remove the weight from the rear wheels. Remove the spring clamp and the shock absorber lower bolt.



1. Rear Spring
2. Rear Spring Seat Cushion—Upper
3. Rear Spring Seat Cushion—Lower
4. Rear Spring Seat

FIGURE 3—*(a) Rear Spring Mounting ("Ambassador" Series Shown). (b) Rear Spring Assembly Sequence.*



1. Shock Absorber Grommet—Upper
2. Shock Absorber Grommet Spacer
3. Shock Absorber Grommet Retainer
4. Rear Spring Seat Cushion—Upper
5. Rear Spring Seat Cushion—Lower
6. Rear Spring Seat
7. Rear Spring Seat Clamp Bolt

FIGURE 4—*Rear Spring and Shock Absorber Assembly Sequence "Ambassador" and "Statesman" Series.*

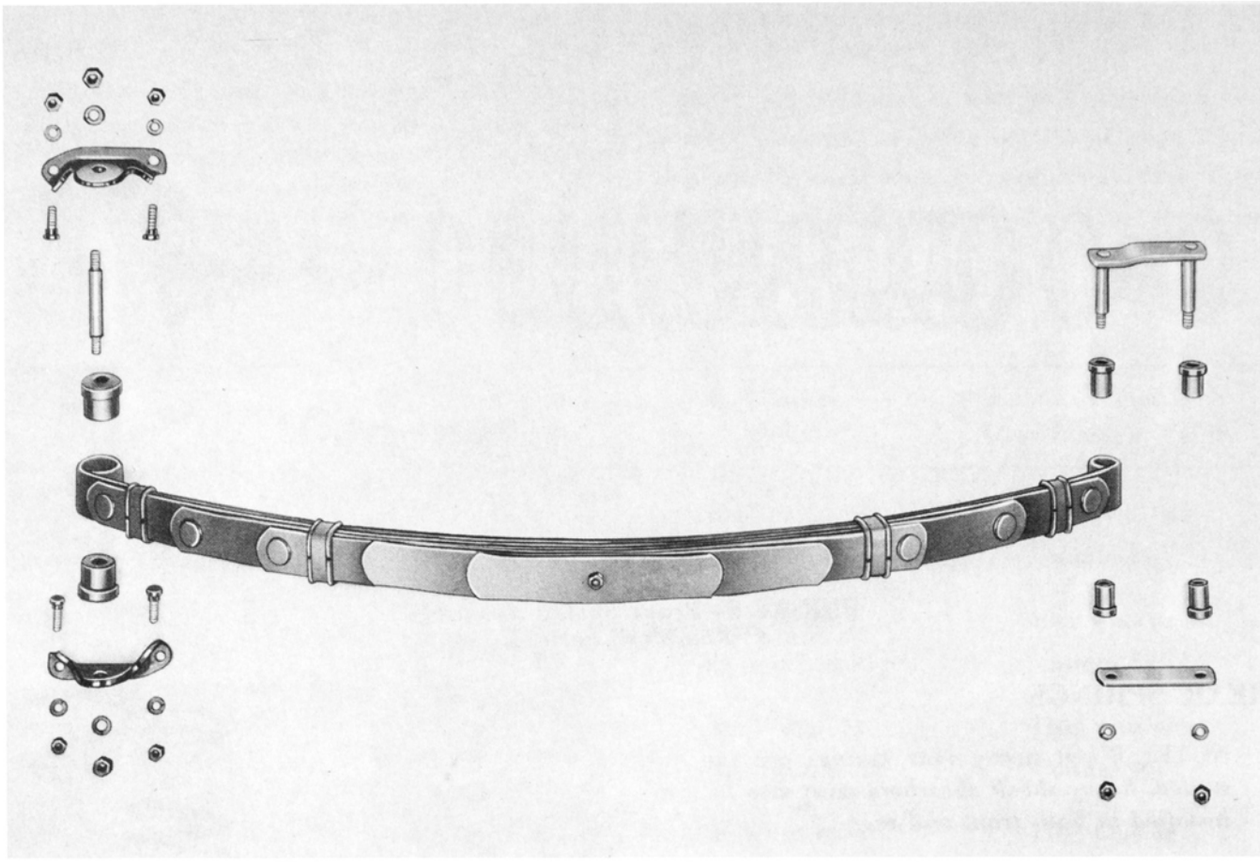


FIGURE 5—*Rear Spring Assembly Sequence "Rambler" Series.*

Lower the axle, remove the lower spring seat, and the rear spring.

"Rambler" Series

Raise and support the rear of the body. Remove the rear spring clips from the axle tubes, the front bracket from the body floor pan, and the rear spring shackles from the body side sill.

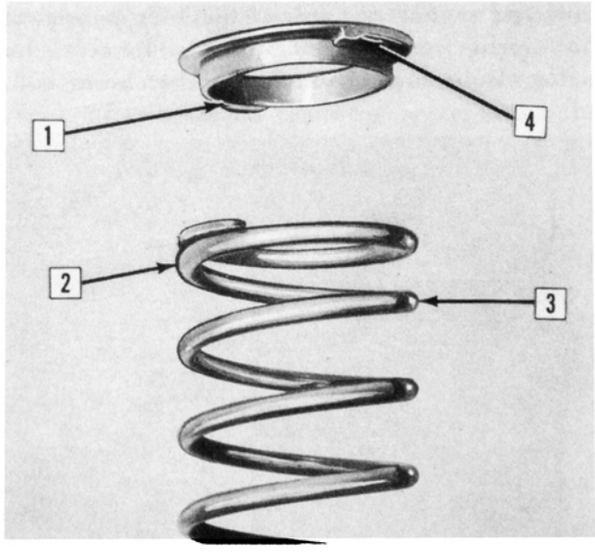
The spring may now be removed from the car.

INSTALLING THE REAR SPRING CUSHIONS

"Ambassador" and "Statesman" Series

Assemble the upper and lower spring cushions on the spring. The cushion has a rubber tab which is inserted between the stationary coil and the first movable coil.

Turn the spring seat cushion until the end of the stationary coil is against the tapered projection of the cushion (Fig. 6).



1. Spring Cushion Tab
2. Stationary Coil
3. First Movable Coil
4. Tapered Projection

FIGURE 6—*Installing Spring Cushion.*

SHOCK ABSORBERS

All shock absorbers front and rear are the direct acting, telescoping type. The end mountings of the shock absorbers are retained in rubber grommets.

The shock absorbers are mounted as shown in Figures 3, 7, and 8. To facilitate removal of the front shock absorbers, loosen the lower control arm at the pivot bar.

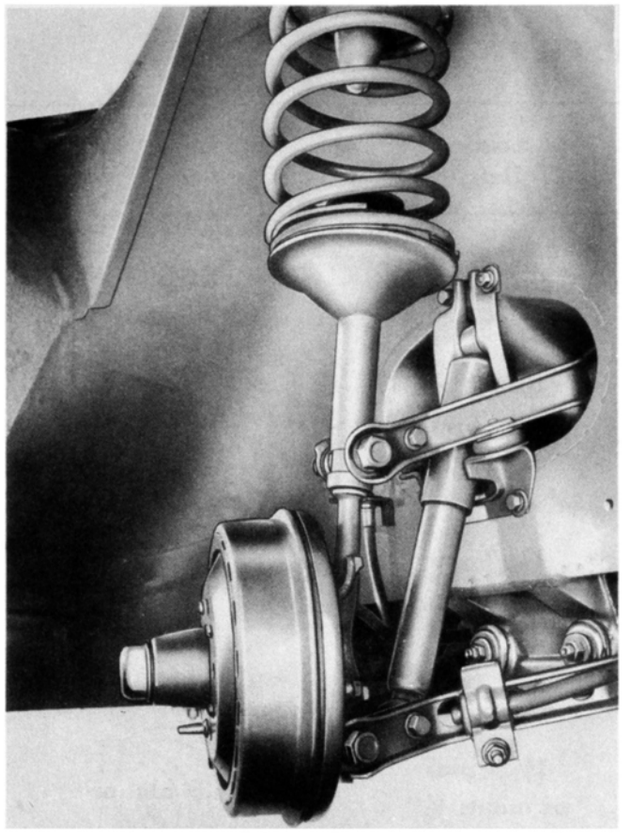


FIGURE 7—*Front Shock Absorber Mounting "Ambassador" and "Statesman" Series.*

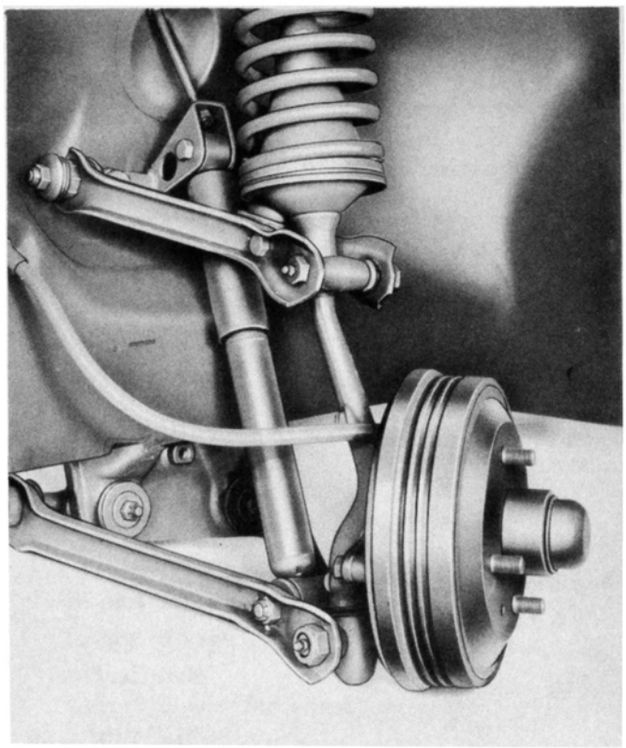


FIGURE 8—*Front Shock Absorber Mounting "Rambler" Series.*

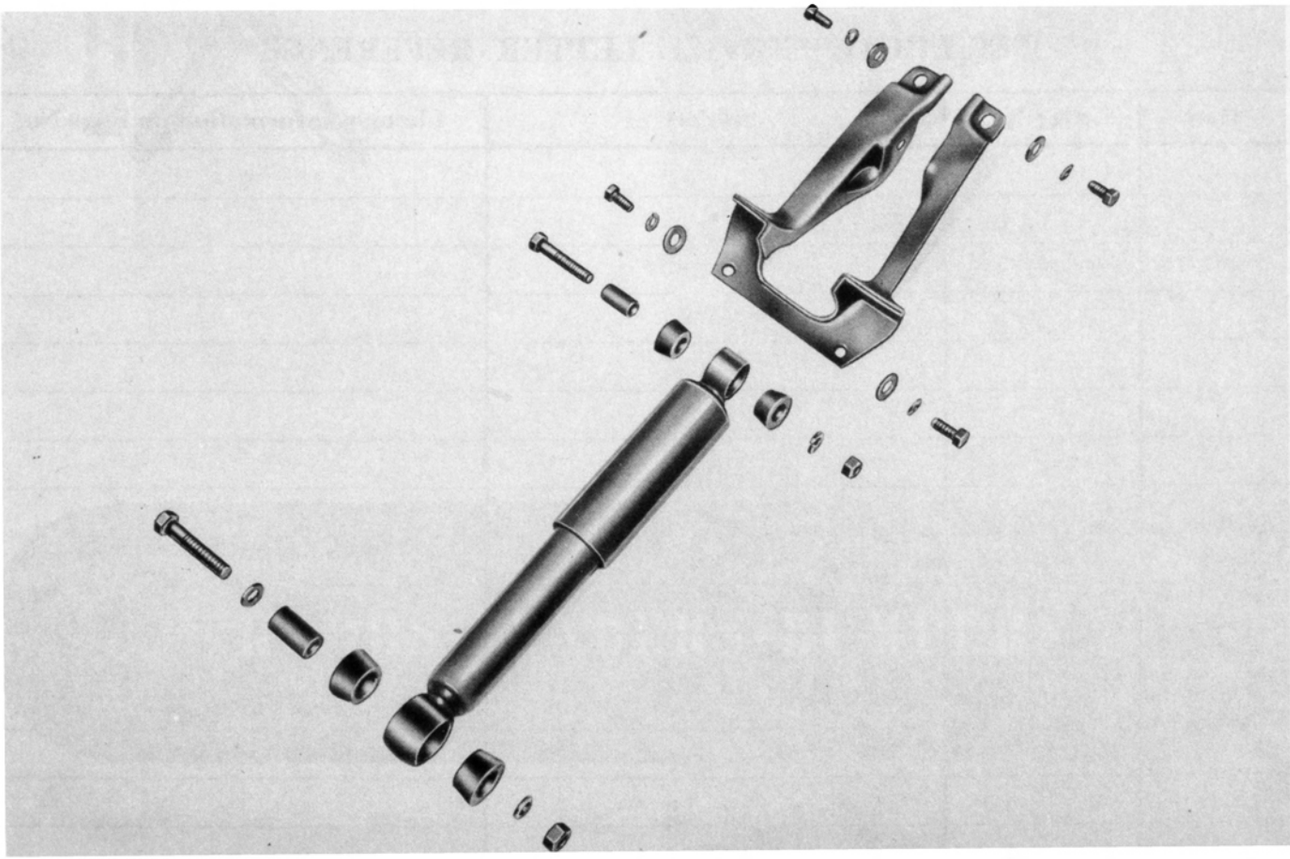


FIGURE 9—*Front Shock Absorber Assembly Sequence "Ambassador" and "Statesman" Series.*

REAR SPRING SPECIFICATIONS

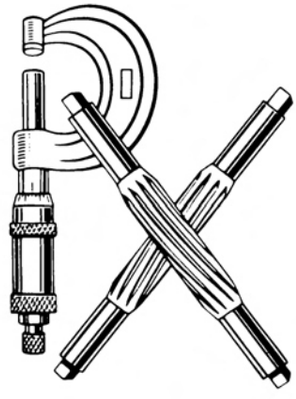
Series	Free Height	Loaded Height	Rate Lbs. Per Inch After Loaded Weight
"Ambassador" and "Statesman" (Light)	17⅞"	10 9/16" at 870# plus or minus 25#	125# plus or minus 5#
"Ambassador" and "Statesman" (Heavy)	15½"	10 17/32" at 870# plus or minus 25#	175# plus or minus 5#
"Rambler" 6 Leaf	7⅞" plus or minus ⅛" center line of eyes to top of main leaf.	1 5/16" plus or minus ⅛" at 650#	100# plus or minus 5#
9 Leaf	7 9/16" plus or minus ⅛" center line of eyes to top of main leaf.	1 5/16" plus or minus ⅛" at 760#	145# plus or minus 8#

TECHNICAL SERVICE LETTER REFERENCE

Date	Letter No.	Subject	Changes information on Page No.

Nash

TECHNICAL SERVICE MANUAL



HOODS—FENDERS—BUMPERS SECTION

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Rear Fender Removal 6

Installing a New Rear Fender 8

BUMPERS 10

SERVICE LETTER REFERENCE 12

HOODS-FENDERS-BUMPERS

HOODS—FENDERS—BUMPERS SECTION

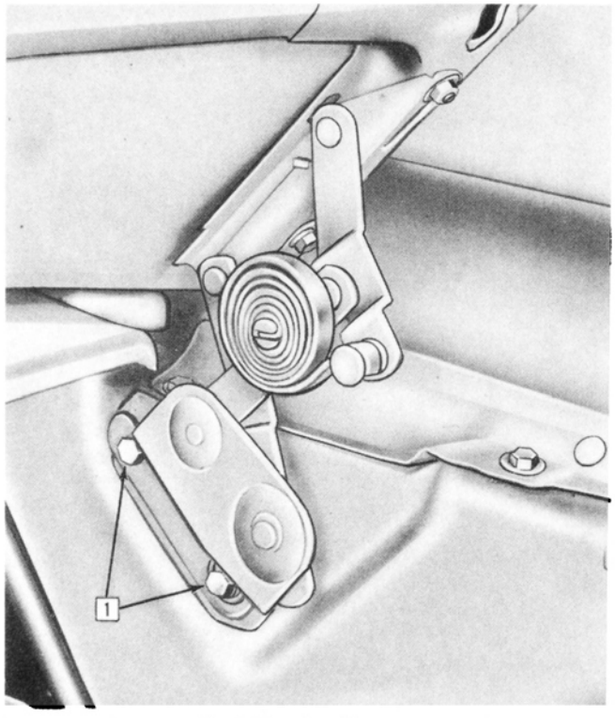
HOODS

The hood is of one piece construction with spring loaded hinges.

HOOD ALIGNMENT

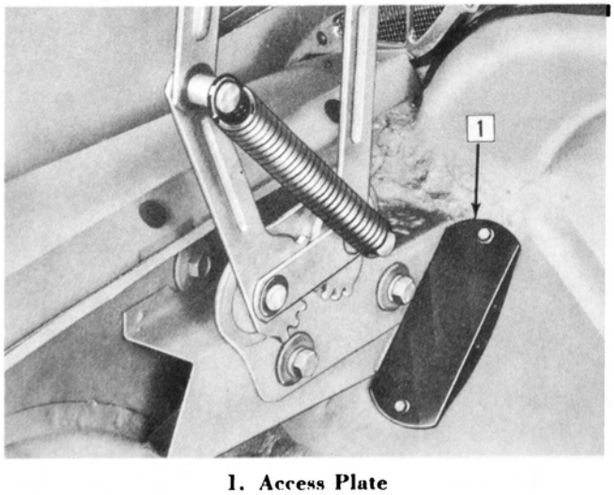
"Ambassador" and "Statesman" Series

The hood hinge to wheelhouse panel cap screw holes are elongated and oversize, to allow clearance to correctly align the hood to body and front fenders (Fig. 1).



1. Adjusting Screws

FIGURE 1—*Hood Hinge.*



1. Access Plate

FIGURE 2—*Hood Hinge "Rambler" Series*

Align the hood by loosening the cap screws, attaching the hood hinge to the wheelhouse panel, and move the hood in direction desired for correct

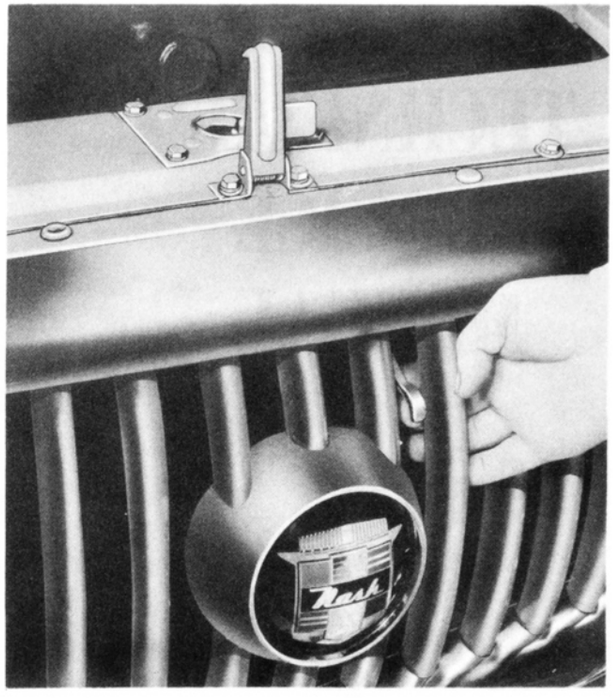


FIGURE 3 — *Hood Release Control "Ambassador" and "Statesman" Series Shown.*

alignment. The size and shape of the cap screw holes will allow movement of the hood. With the hood aligned to the desired position, retighten the cap screws.

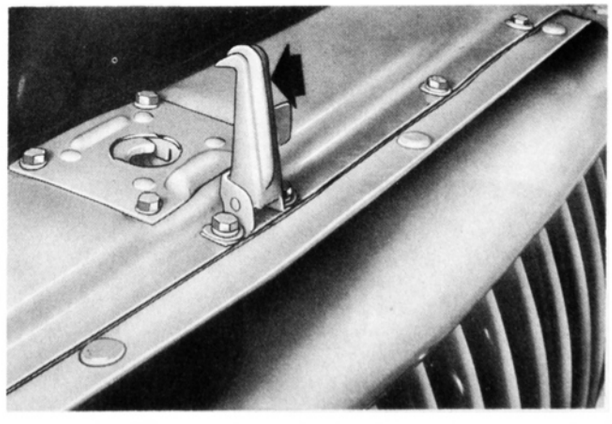


FIGURE 4—*Hood Lock Safety Catch.*

"Rambler" Series

Align the hood by removing the access plates from both sides of the dash panel (Fig. 2).

Then loosen the hinge mounting cap screws, lower the hood, and locate it in the desired position. The cap screws are accessible from underneath the instrument panel, through the access hole in the dash panel. The mounting cap screws may now be retightened.

All Series

If the opening between the hood and fender is too large, loosen the fender and shift the assembly to equalize the opening. Clearance has been provided in the fender bolt holes for alignment.

HOOD CONTROL

The hood release control is located just inside the center of the grille (Fig. 3).

To release the hood, reach in behind the grille and trip the hood lock lever. This releases the hood lock allowing the hood to raise against the safety catch (Fig. 4).

The safety catch must completely engage the upper lock plate to prevent the possibility of the hood opening up accidentally.

Apply lubriplate to all friction areas.

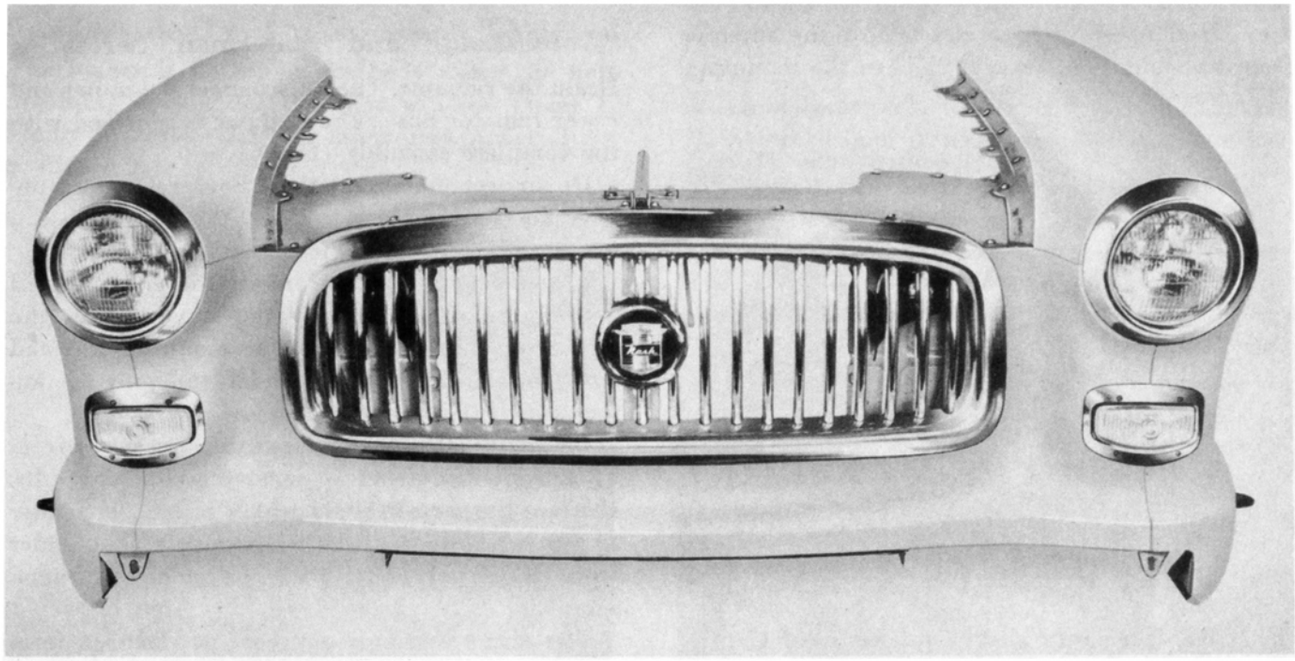


FIGURE 5—*Front Fender and Radiator Grille Panel Assembly "Ambassador" and "Statesman" Series.*

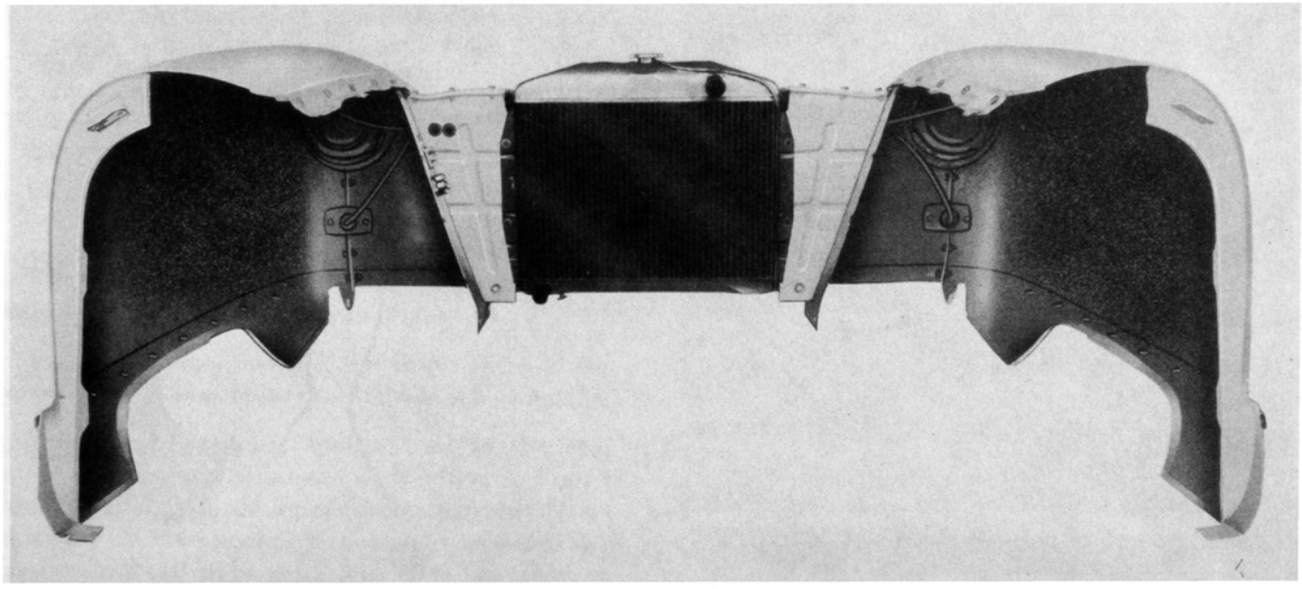


FIGURE 6—*Front Fender and Radiator Grille Panel Assembly "Ambassador" and "Statesman" Series.*

FENDERS

FRONT FENDERS

The front fenders are of one piece construction and can be removed individually, or the two front fenders with the grille can be removed as a complete assembly.

FRONT FENDER REMOVAL

Remove the head and parking lamp assemblies from the fender and grille panel assembly. Protect the paint surface and allow both assemblies to hang by their wires.

If the car is radio equipped, disconnect the antenna lead at the antenna and remove the antenna from its mounting bracket. Remove the mounting nut and seal from the top of the fender and pull the antenna down through the fender.

Remove the bumper impact bar. Then remove the back bar assembly, the side from which the fender is to be removed.

Remove the bolts that connect the fender to the grille panel, and the metal screws that fasten the fender to the wheelhouse panel and front body pillar.

The fender can now be removed.

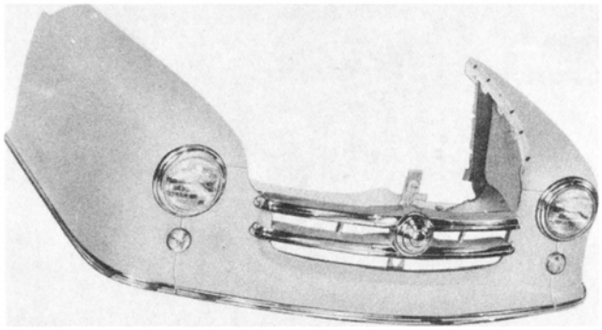


FIGURE 7—*Front Fender and Radiator Grille Panel Assembly "Rambler" Series.*

FRONT FENDER AND GRILLE ASSEMBLY REMOVAL

"Ambassador" and "Statesman" Series

Drain the radiator. Then disconnect the upper and lower radiator hose. The radiator is removed with the complete assembly (Fig. 6).

Disconnect the wires at the horn relay, and the head and parking lamp wires at the junction block on the left front wheelhouse extension panel.

If radio equipped, disconnect the antenna lead at the antenna and remove the antenna from the mounting bracket. Remove the mounting nut and seal from the top of the fender and pull the antenna down through the fender.

Disconnect the wheelhouse extension panel from the wheelhouse panel by removing nuts and bolts. Remove the metal screws which fasten the fender to the wheelhouse panel. Disconnect the fender from the front body pillar by removing metal screws.

The entire assembly can now be removed from car.

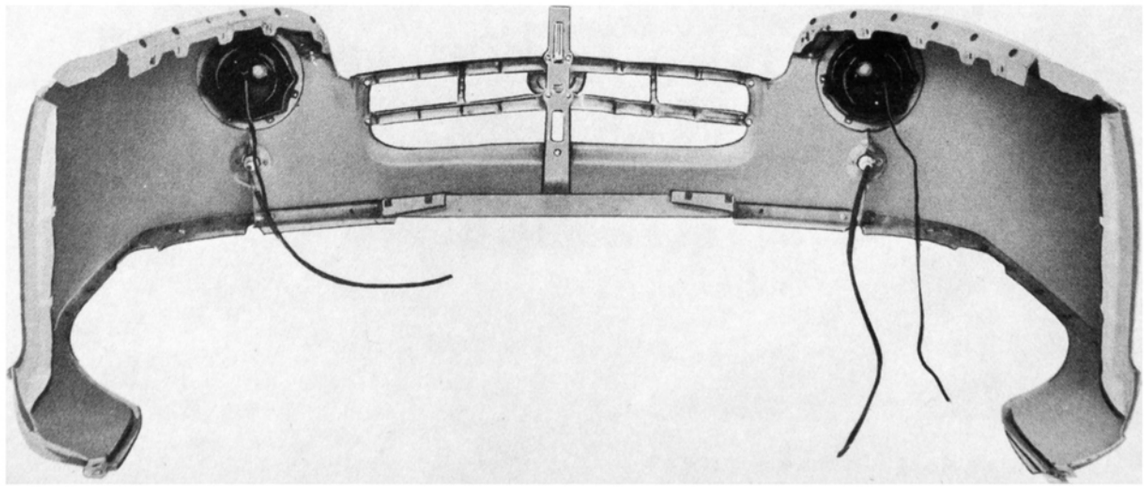


FIGURE 8—*Front Fender and Radiator Grille Panel Assembly "Rambler" Series.*

"Rambler" Series

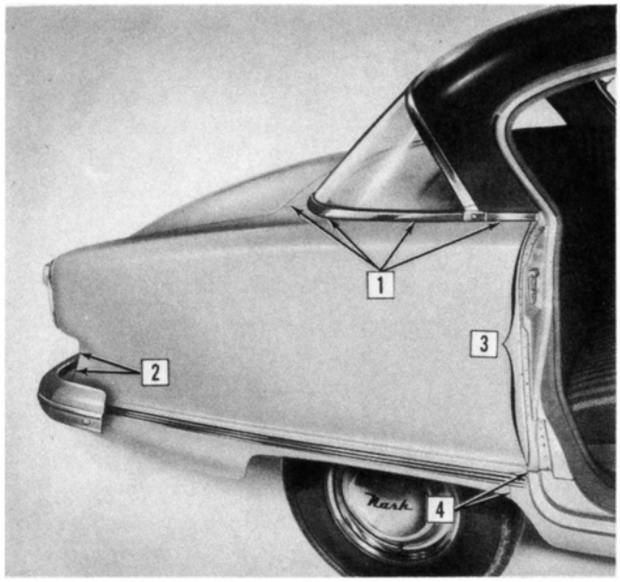
The "Rambler" Series front fender and grille panel assembly removal procedure varies only from the "Ambassador" and "Statesman" Series in that the radiator is not removed with the assembly. It remains on the car as the radiator supports are bolted to the wheelhouse panels. The "Rambler" Series assembly is shown in Figures 7 and 8.

REAR FENDERS

The rear fenders are spot welded and bolted to the body forming an integral part of the body. They can be removed and replaced when necessary.

"Ambassador" and "Statesman" Series

The fender is bolted to the body along the belt moulding line under the rear window (Item 1, Figure 9) and to the rear lower deck panel (Item 2, Figure 9).



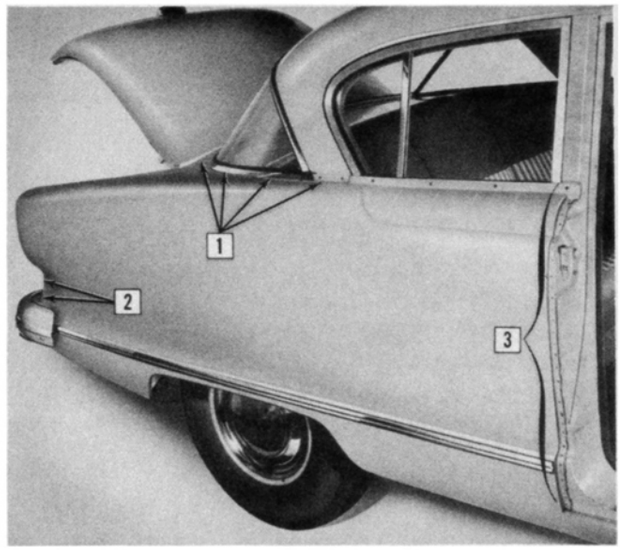
1. Fender to Body (Rear Quarter Side Panel and Belt Rail) Bolt Locations
2. Fender to Rear Lower Deck Panel Bolt Locations
3. Spot Weld Locations
4. Front Extension to Rear Fender Weld

FIGURE 9—*Rear Fender Attaching Bolt and Weld Locations (Four Door Model).*

The bolt locations of the fender to rear lower deck panel are also shown in Figure 11.

In the two door models, the lower skirt of the rear fender is also bolted to the side sill (Fig. 12).

The fender flange is spot welded to the rear quarter body lock pillar assembly (Item 3, Figs. 9 and 10) and to the fender extension assembly (Item 4, Fig. 9). The remaining spot weld locations are around the tail light mounting plate assembly attaching the plate to the lower rear deck panel (Item 3, Fig. 13), and the fender flange to the rear



1. Fender to Body (Rear Quarter Side Panel and Belt Rail) Bolt Locations
2. Fender to Rear Lower Deck Panel Bolt Locations
3. Spot Weld Locations

FIGURE 10—*Rear Fender Attaching Bolt and Weld Locations (Two Door Model).*

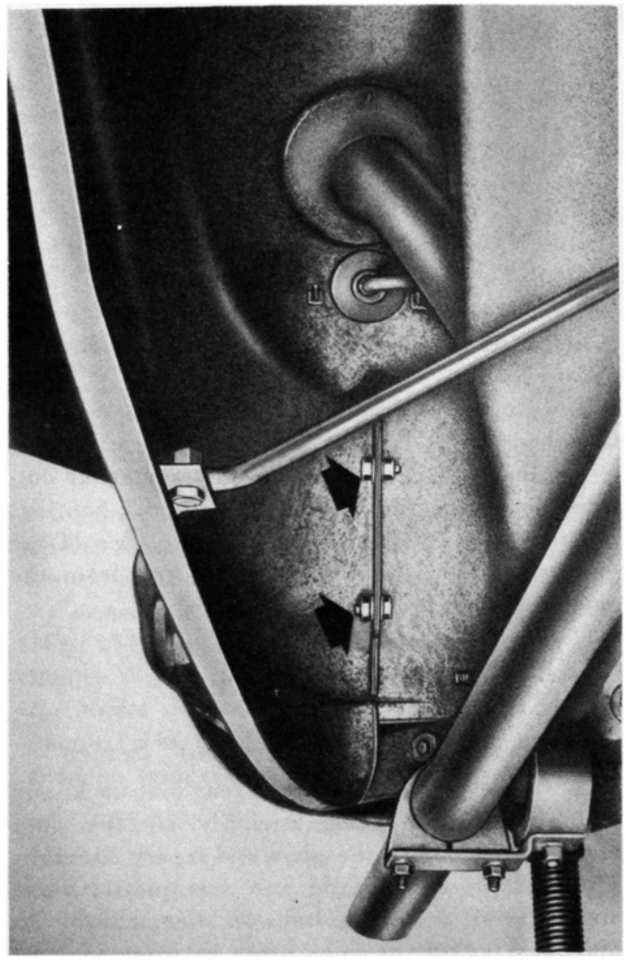


FIGURE 11—*Rear Fender to Lower Deck Panel Attaching Bolt Location.*

quarter side panel to form the rear deck drain trough (Item 1, Fig. 13).

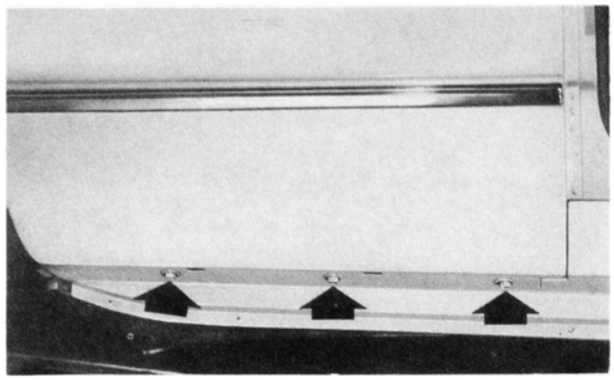


FIGURE 12—*Fender to Side Sill Attaching Bolt Locations (Two Door Model).*

"Rambler" Series Convertible and Country Club Models

The fender is bolted to the rear quarter panel along the body belt line (Item 1, Figs. 14 and 18).

The front flange of the rear fender is spot welded to the rear quarter body lock pillar (Item 2, Fig. 14). The lower front edge of the fender skirt is welded to the rear edge of the side sill panel (Item 3, Fig. 14).

The rear of the fender is spot welded to the rear quarter side panel from the belt line down the rear deck cover opening as far as the lower deck panel (Item 4, Fig. 14). It is bolted to the lower deck panel (Item 5, Fig. 14).

"Rambler" Series Station Wagon Models

The rear fender is bolted to the rear quarter side panel at the belt rail (Item 1) and at Item 4, Figure 15.

The front flange of the fender (Item 2, Fig. 15) is spot welded to the lock pillar and side sill panel.

The fender is also welded to the body at the outside edge of the tail lamp opening (Item 5, Fig. 15).

There is one bolt at the rear lower edge of the fender which is installed and removed from the outside of the car (Item 3, Fig. 15).

REAR FENDER REMOVAL PROCEDURE

"Ambassador" and "Statesman" Series

Remove the rear seat cushion, rear seat back, and rear quarter trim panel assembly. On two door models also remove the glass and frame assembly. This will expose the fender to rear quarter panel and belt rail mounting bolts so they may be removed (Fig. 16).

Remove the rear bumper assembly.

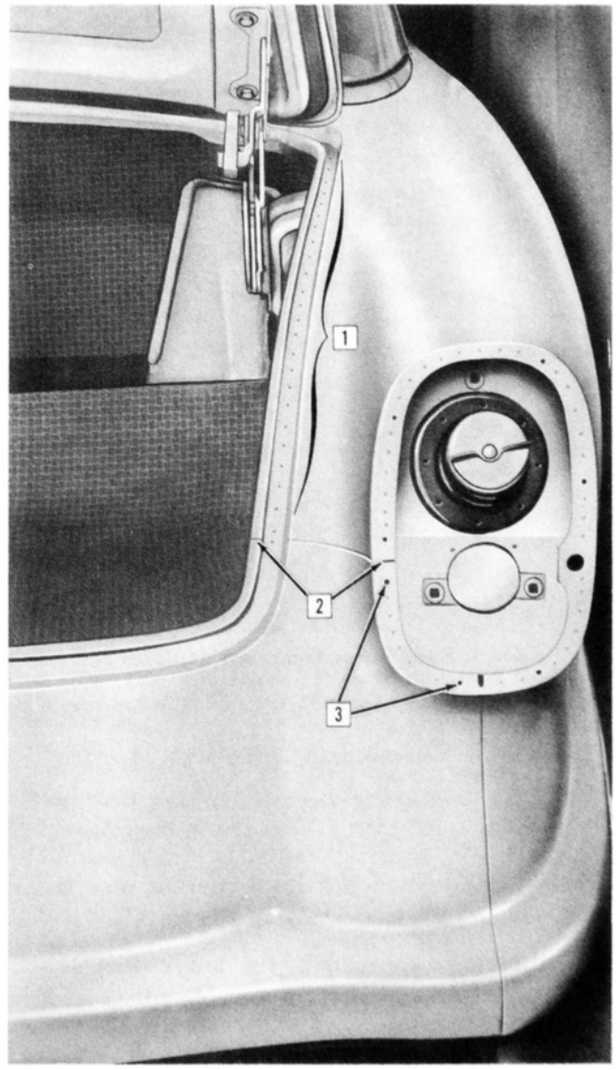
Remove the bolts attaching the fender to rear lower deck panel and fender brace rod (Fig. 11). The two door model also has three bolts attaching the lower front of the rear fender skirt to the body side sill (Fig. 12).

Connect milling tool #J-3041 (Fig. 17) to a ¼" electric drill and mill out the spot welds attaching the fender to the rear quarter body lock pillar (Item 3, Figs. 9 and 10).

The rear fender front extension weld must be cut from the fender on the four door model (Item 4, Fig. 9).

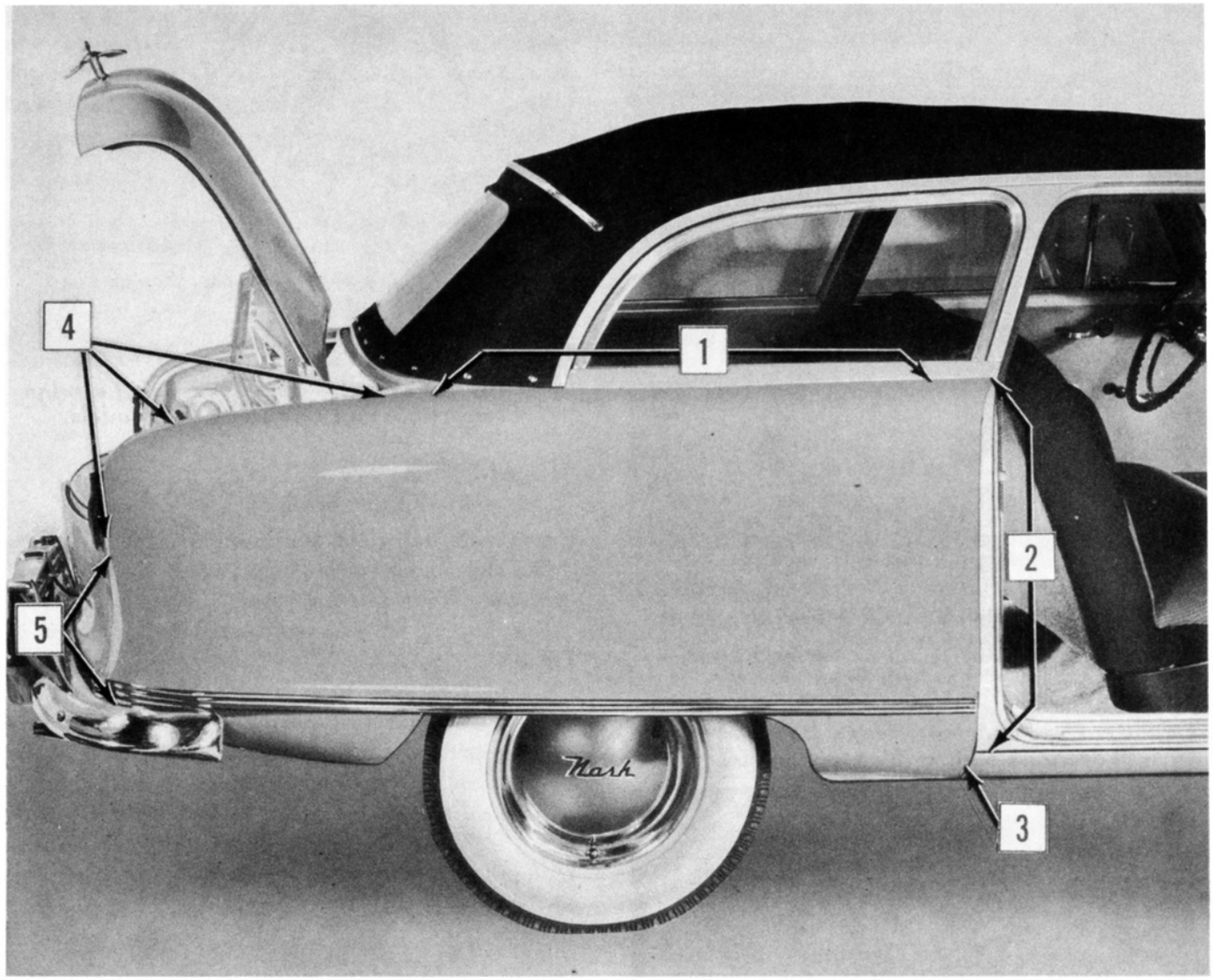
Remove the gasoline filler tube, grommet, and tail light assembly.

Mill out the spot welds attaching the fender to the rear quarter side panel (Item 1, Fig. 13) and the tail light mounting plate assembly (Item 3, Fig. 13). Cut the welds attaching the fender to the lower rear deck panel (Item 2, Fig. 13). The rear fender can now be removed.



1. Fender Flange to Rear Quarter Side Panel Spot Welds—Forms Deck Drain Trough
2. Fender to Lower Deck Panel Weld
3. Tail Light Mounting Plate to Rear Lower Deck Panel Spot Welds

FIGURE 13—*Rear Fender Weld Locations.*



1. Fender to Body Bolt Location Along Belt Line
2. Fender to Body Lock Pillar Spot Welds
3. Fender to Side Sill Flange Weld
4. Fender to Rear Quarter Side Panel Spot Welds Along the Trunk Opening
5. Fender to Lower Deck Panel Bolt Location (Note Two Bolts Inside of Trunk, One Bolt Under Fender)

FIGURE 14—*Fender Attaching Bolt and Weld Location Convertible and Country Club Models.*

CAUTION: *When milling out a spot weld, mill through one thickness of metal only. Do not force the milling tool beyond the thickness of the fender metal. It may be necessary in some cases to remill some of the spots where the spot welds are still holding. Do not force the fender if the weld is not broken, as the rear quarter side panel may become distorted.*

"Rambler" Series
Convertible and Country Club Models

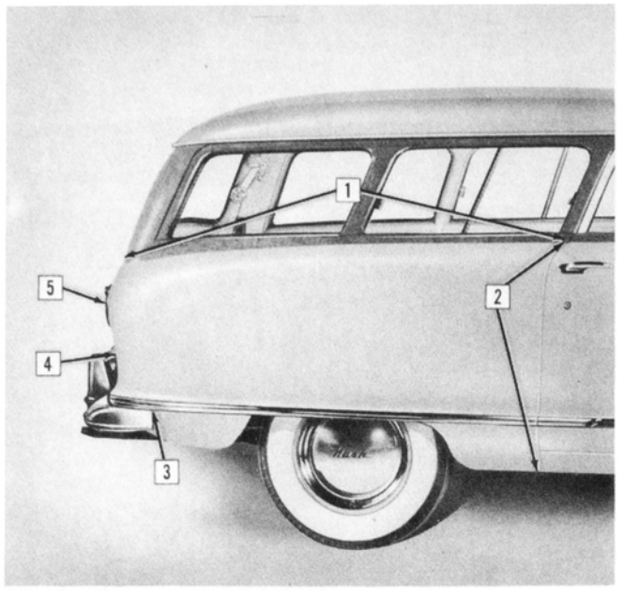
Remove the rear seat cushion, seat back, rear quarter trim panel, and the rear quarter glass assembly. This will expose the fender to rear quarter side panel mounting bolts so they can be removed (Fig. 18).

Remove the bumper and tail light assemblies.

Remove the three screws that fasten the rear fender to the lower deck panel (Item 5, Fig. 14). Cut the weld at the side sill panel (Item 3, Fig. 14).

Connect an electric drill to milling tool #J-3041 (Fig. 17) and mill out the spot welds fastening the fender to body lock pillar (Item 2, Fig. 14) and the fender to the rear quarter panel along the deck opening (Item 4, Fig. 14). The rear fender can then be removed from the body.

CAUTION: *When milling out a spot weld, mill through one thickness of metal only. Do not force the milling tool beyond the thickness of the fender metal. It may be necessary in some cases to remill some of the spots where the spot welds are still holding. Do not force the fender if the welds are not broken, as the rear quarter panel may become distorted.*



1. Fender to Body Bolt Locations Along Belt Line
2. Fender to Lock Pillar Spot Welds
3. Rear Lower Edge of Fender to Body Bolt Location
4. Rear End of Fender to Body Bolt Location
5. Fender to Tail Light Opening Welds

FIGURE 15—*Fender Attaching Bolt and Weld Locations Station Wagon Models.*

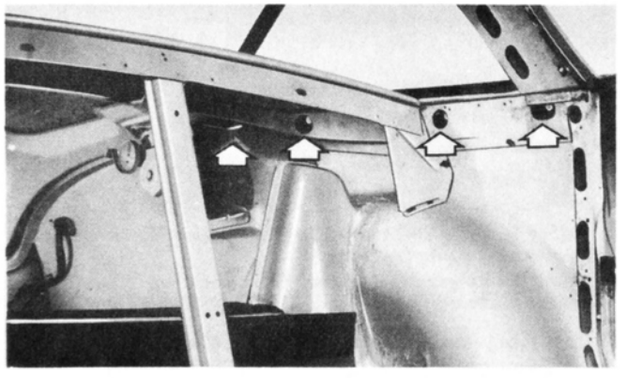


FIGURE 16—*Fender Attaching Bolt Locations. "Ambassador and Statesman Series"*

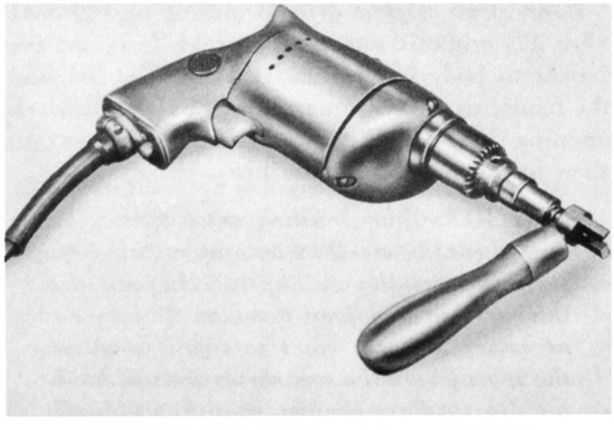


FIGURE 17—*Milling Tool #J-3041 Attaching to ¼" Drill.*

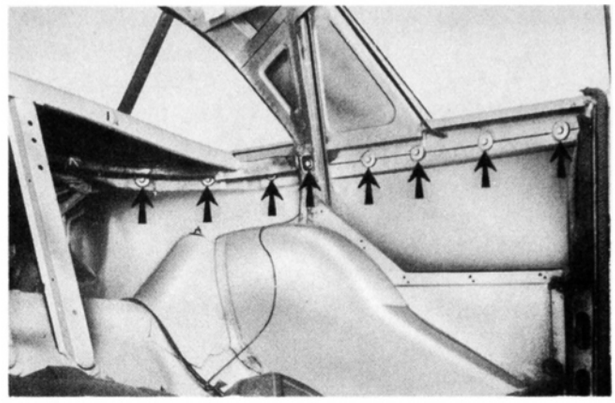


FIGURE 18—*Fender Attaching Bolt Location Convertible and Country Club Models.*

"Rambler" Series Station Wagon Models

Remove the tail light and bumper assemblies.

Cut the fender to tail light welds on the outside of the tail light opening (Item 5, Fig. 15).

Cut fender to side sill panel weld (Item 3, Fig. 14).

Connect milling tool #J-3041 (Fig. 17) to ¼" electric drill and mill out the spot welds attaching the fender to the lock pillar (Item 2, Fig. 15).

Remove the rear quarter trim panels.

Remove the lower fender to body bolt (Item 3, Fig. 15). Figure 19 illustrates the remainder of the fender to body mounting bolt locations. Removal of these bolts will complete the fender removal.

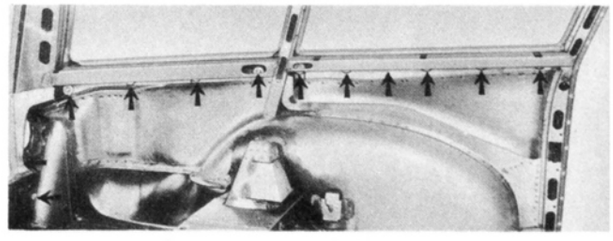


FIGURE 19—*Fender to Body Attaching Bolt Locations Station Wagon Models.*

INSTALLING A NEW REAR FENDER

"Ambassador" and "Statesman" Series

Clean the surfaces where the fender and body contact each other. They must be smooth and clean. Apply paint or a suitable rust preventative to the mating surfaces. Also apply a generous amount of Nash Body Sealer to the area where the fender contacts the body.

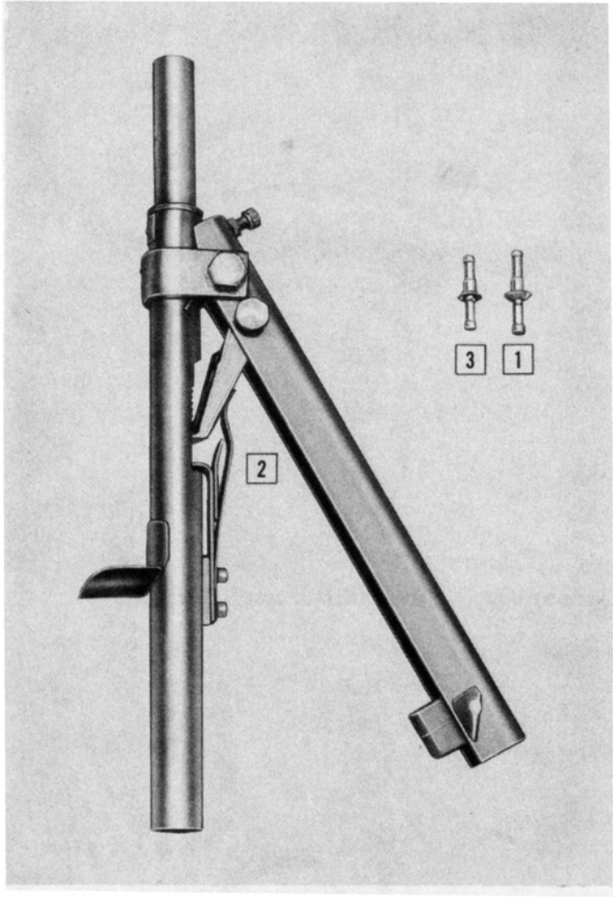
Place the new fender in position using drifts or dowel pins to align the fender and install the two bolts that fasten the rear fender to the rear lower deck panel (Item 2, Figs. 9, 10, and 11).

Clamp the front flange of the fender to the rear quarter lock pillar. The fender to rear quarter side

panel attaching bolts (Item 1, Figs. 9 and 10) can now be installed. Two door models also require the installation of rear fender lower front skirt to side sill mounting bolts (Fig. 12).

NOTE: *Recheck fender alignment before tightening bolts.*

Drill holes, with No. 10 drill, through the fender front flange and rear quarter lock pillar starting at the belt moulding line and spacing the holes approximately 2½" apart. Countersink the holes with a blunt punch and insert Cherry Head Rivets, CR-316-6-8 countersunk head, and fasten with Cherry Rivet Gun #G-35 (Fig. 20).



1. Brazier Head Cherry Rivet
2. Cherry Rivet Gun G-35
3. Countersunk Cherry Rivet

FIGURE 20—*Cherry Rivets and Gun G-35.*

Clamp the fender flange to the rear quarter side panel to form the deck drain trough.

Align the fender and tail light mounting plate to the lower deck panel (Item 3, Fig. 13). Drill three holes, with No. 10 drill, through the deck panel flange and the mounting plate; countersink holes, and fasten with Cherry Rivets CR-316-6-8 countersunk head.

Clamp the fender flange to the rear quarter side panel to form the deck drain trough. Using a No. 10 drill, drill holes through the rear fender flange and the rear quarter side panel. Space the holes approximately 3" apart. Then install CR-317-6-8 brazier head Cherry Rivets.

In the four door models, braze the lower front edge of the fender skirt to the extension assembly (Item 4, Fig. 9).

NOTE: *These Cherry Rivets are of the pull-through type and should be sealed with Nash Body Sealer or Nash Plastikon Putty.*

Then refinish the fender.

"Rambler" Series Convertible and Country Club Models

Clean the surfaces where the fender and body contact each other. They must be smooth and clean. Apply paint or a suitable rust preventative to the mating surfaces. Also apply a generous amount of Nash Body Sealer to the contacting areas.

Place the fender in position; install the fender to the rear quarter side panel screws for alignment; install the fender to lower deck panel mounting bolts.

Clamp the front of the fender to the rear body lock pillar and drill holes, use a No. 10 drill, approximately 2½" apart through the fender front flange and body lock pillar. Countersink the holes with a blunt punch and install countersunk head Cherry Rivets No. CR-316-6-8. Fasten with Cherry Rivet Gun No. G-35 (Fig. 20).

Clamp the fender flange to the rear deck opening flange and drill six holes equally spaced using a No. 10 drill. Then fasten with brazier head Cherry Rivets CR-317-6-8.

Braze the lower front edge of the fender to the side sill panel. Then refinish the fender.

"Rambler" Series Station Wagon Models

Clean the surfaces where the fender and body contact each other. They must be smooth and clean. Apply paint or a suitable rust preventative to the mating surfaces. Also apply a generous amount of Nash Body Sealer to the contacting areas.

Place the fender in position and install the fender to body bolts for alignment (Fig. 19). Then clamp the front flange of the fender to the lock pillar and the lower front flange to the side sill panel.

Drill holes (No. 10 drill) approximately 2½" apart through the front flange and the lock pillar. Countersink the holes with a blunt punch and install Cherry Rivets No. CR-316-6-8 countersunk head. Fasten with Cherry Rivet Gun #G-35 (Fig. 20).

Weld or braze the lower front edge of fender to the side sill panel, and the rear section to the tail light opening bracket.

To prevent "bridging" of the paint, remove all surplus body sealer from the top of the fender leaving a 1/8" *deep crease line* between the fender and body. Then refinish the fender.

NOTE: *The recommended Cherry Rivets are of the pull-through type and should be sealed with Nash Body Sealer or Plastikon Putty.*

FRONT AND REAR BUMPERS

The front and rear bumpers are heavy one piece steel stamping, chrome plated, fastened to the front and back of the body frame at the side sills.

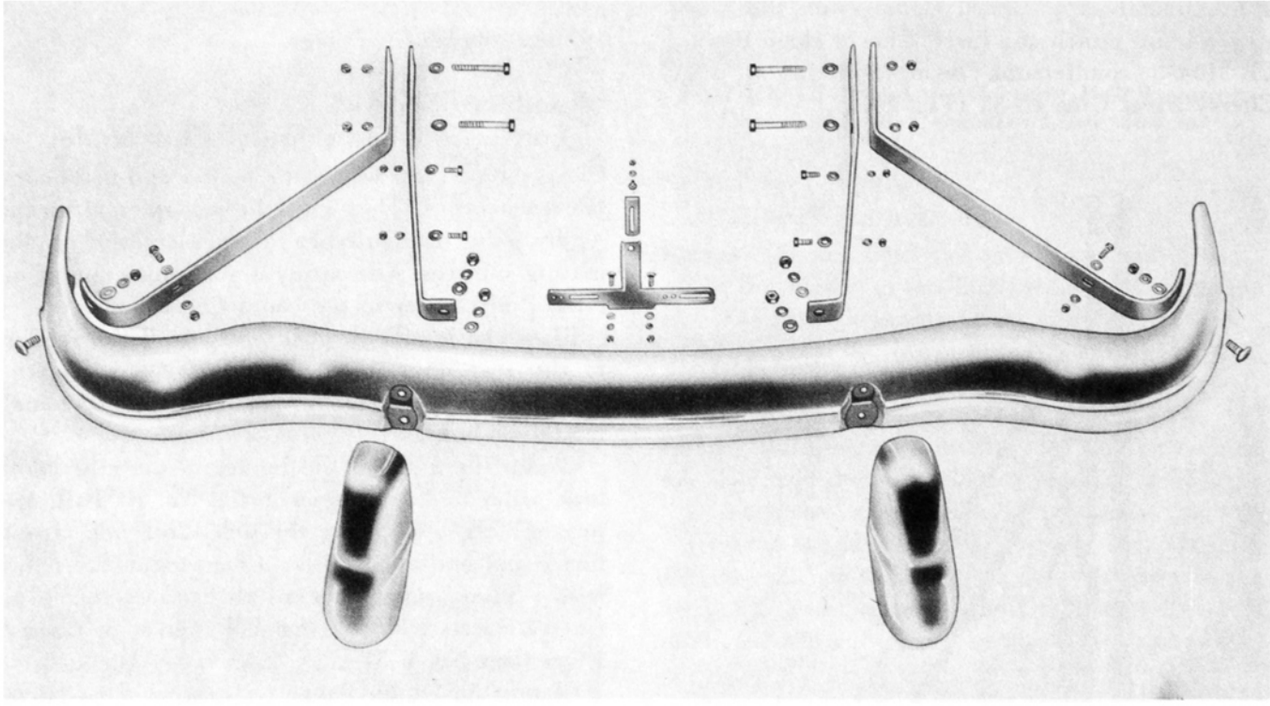


FIGURE 21—*Front Bumper Assembly "Ambassador" and "Statesman" Series.*

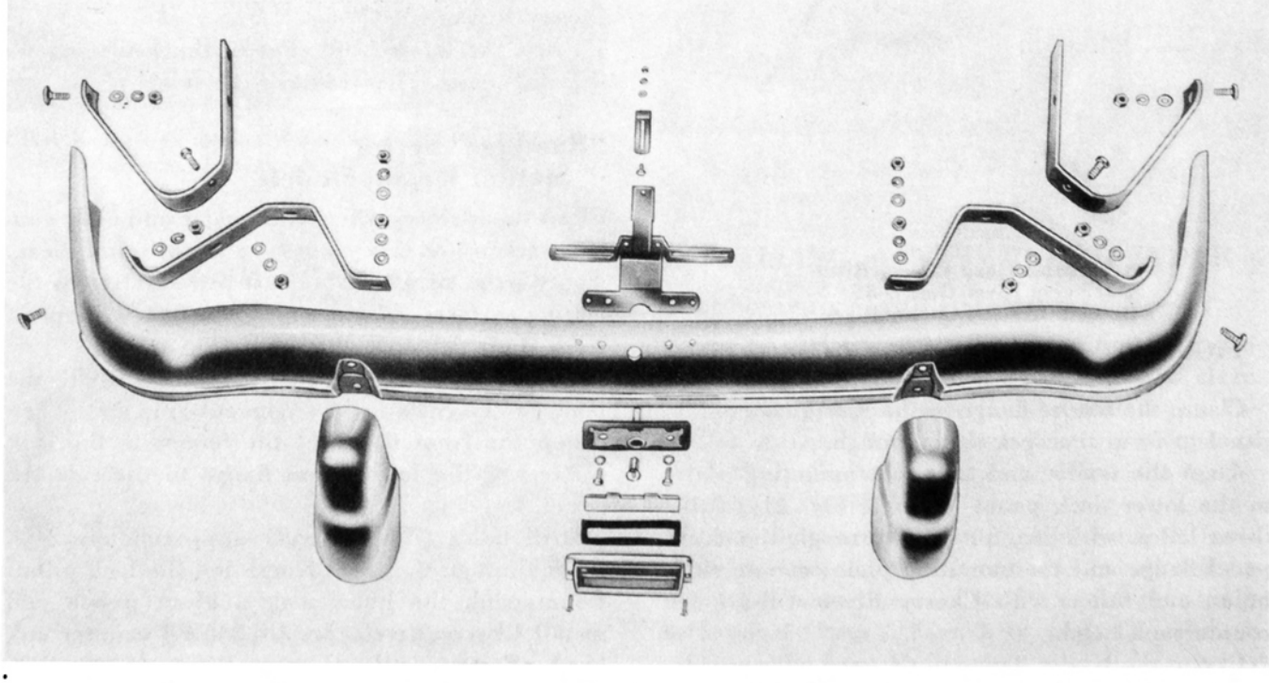


FIGURE 22—*Rear Bumper and License Lamp Assembly "Ambassador" and "Statesman" Series.*

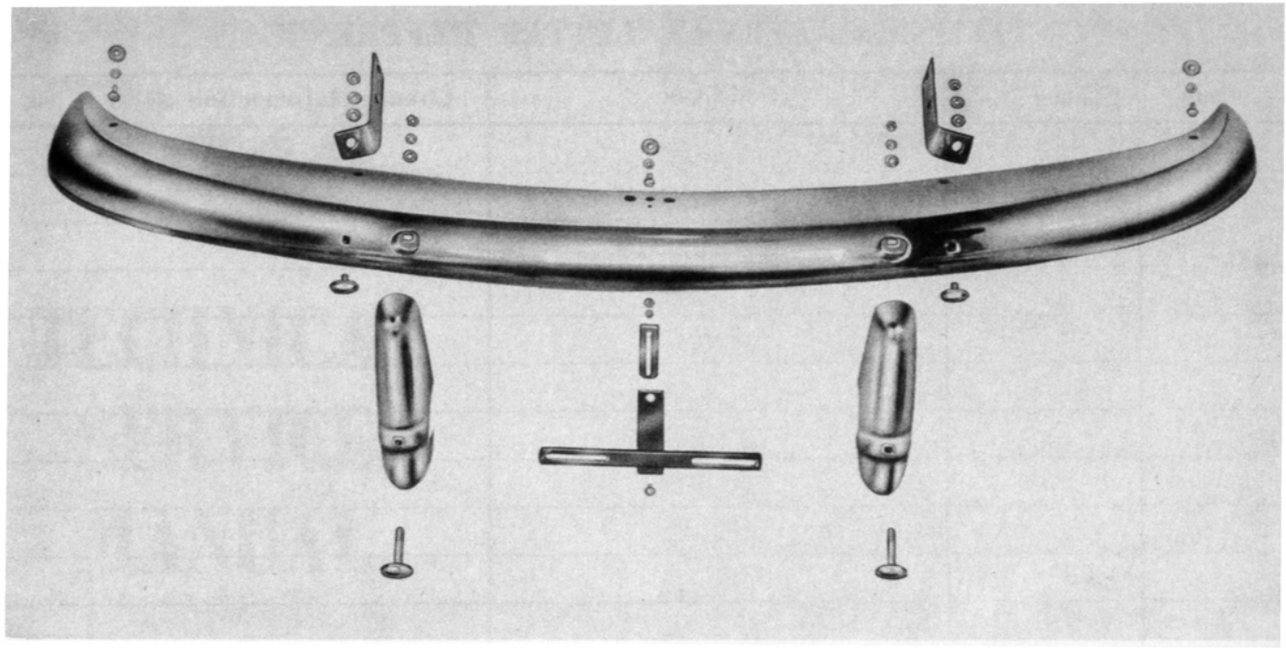


FIGURE 23—*Front Bumper Assembly "Rambler" Series.*

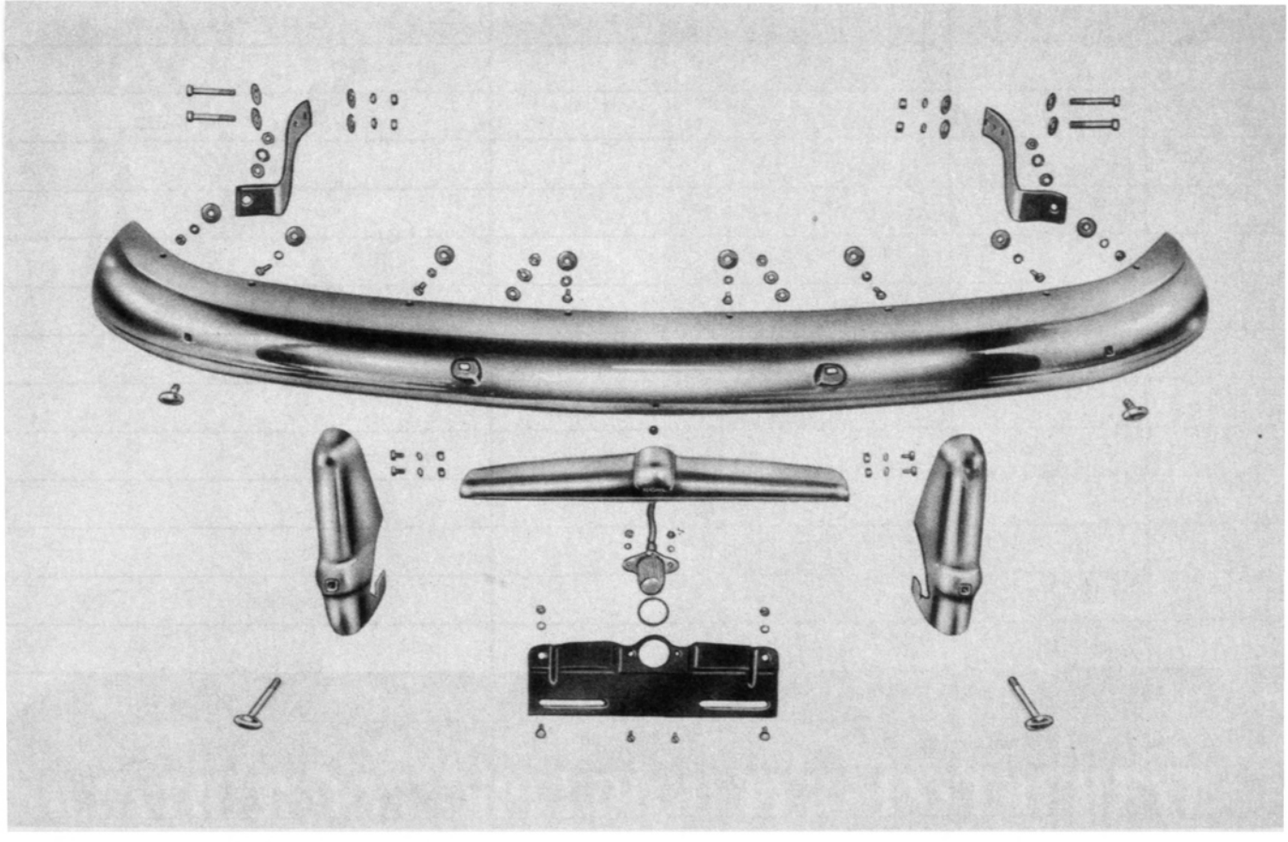


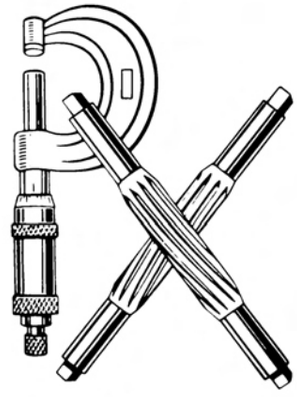
FIGURE 24—*Rear Bumper and License Lamp Assembly "Rambler" Series.*

TECHNICAL SERVICE LETTER REFERENCE

Date	Letter No.	Subject	Changes information on Page No.

Nash

TECHNICAL SERVICE MANUAL



WEATHER EYE
SPEEDOMETER
INSTRUMENT SECTION

WEATHER EYE 2
- Summer Driving 2
- Winter Driving 3
- Defrosting 3
- Water Valve Control and Switch 5
- Water Control Valve 5
- Cowl Ventilator Damper Adjustment .. 5
- Air Filter 5
- Heater Core Removal 6
- Heater and Defroster Motor Removal .. 7
- Removal of Water Valve Control and Switch Assembly 9
- Water Control Valve Removal 11
- Water Control Valve Adjustment 11
- Removing Cowl Ventilator Intake Cover Panel and Screen 12

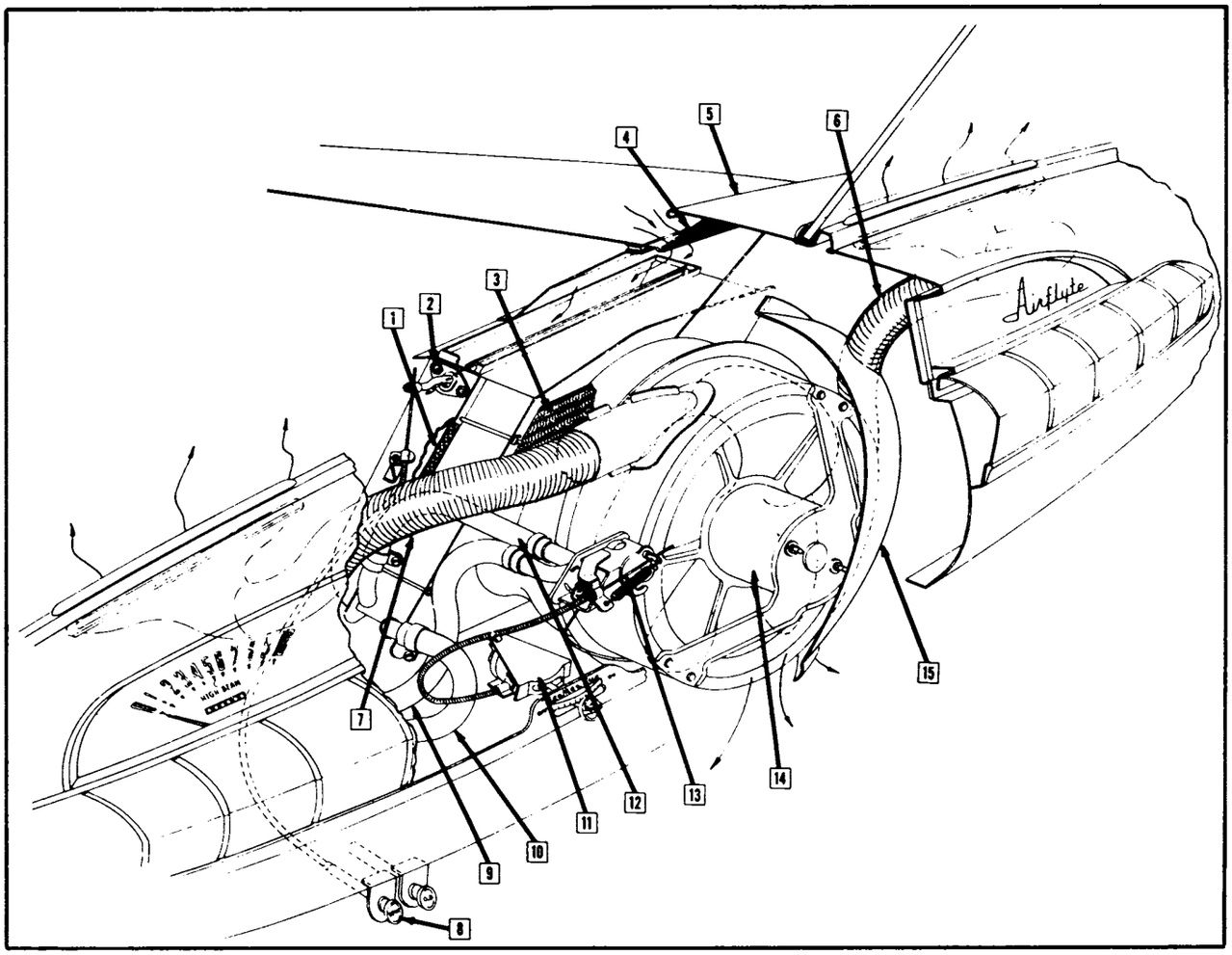
SPEEDOMETER 12

INSTRUMENT GAUGES 14

SERVICE LETTER REFERENCE 15

WEATHER EYE - SPEEDOMETER - INSTRUMENT

WEATHER-EYE—SPEEDOMETER—INSTRUMENT SECTION



1. Air Filter
2. Cowl Ventilator Damper
3. Heater Core
4. Cowl Ventilator Screen
5. Cowl Ventilator Intake Cover
6. Right Defroster Hose
7. Left Defroster Hose
8. Cowl Ventilator Damper Control
9. Cylinder Head to Water Control Valve Hose
10. Heater Core to Water Pump Hose
11. Water Valve Control and Heater and Defroster Switch
12. Water Control Valve to Heater Core Hose
13. Water Control Valve
14. Heater and Defroster Motor
15. Heater Shroud

FIGURE 1—*Nash Weather-Eye System "Ambassador" and "Statesman" Series.*

WEATHER-EYE

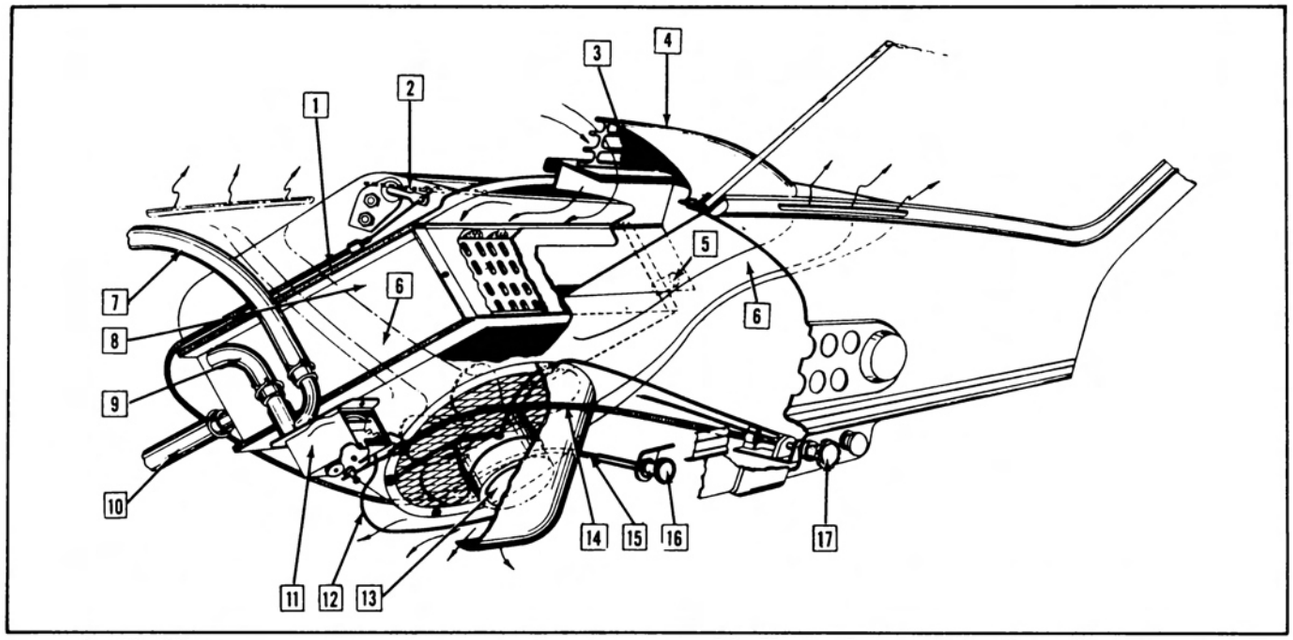
The Nash Weather Eye is designed to provide clean, fresh filtered air for summer driving, and clean, fresh filtered, and heated air within the car for winter driving.

It is, therefore, very important to know how the Nash Weather Eye functions and is operated to obtain the best possible results.

SUMMER DRIVING

The cowl ventilator control knob and cable, which operates the cowl ventilator damper, is located at the left side below the instrument panel on the "Ambassador" and "Statesman" Series (Fig. 3) and at the right side of the steering column below the control panel on the "Rambler" Series (Fig. 4).

The cowl ventilator damper should be open at all times except when washing the car. During summer operation, the water control valve should be in the fully closed position. Air entering the open cowl ventilator is screened, filtered, and circulated within the car. For added circulation of fresh filtered air, the rear quarter ventilators on the four sedans and the rear quarter windows in the two door models should be opened slightly.



1. Air Filter
2. Cowl Ventilator Damper
3. Cowl Ventilator Screen
4. Cowl Ventilator Hood
5. Cowl Ventilator Drain Tube
6. Built-In Defroster Air Ducts
7. Water Control Valve to Cylinder Head Hose
8. Heater Core
9. Water Control Valve to Core Inlet Hose
10. Heater Core to Water Pump Hose
11. Water Control Valve
12. Water Control Valve Capillary Tube
13. Heater and Defroster Motor
14. Water Control Valve Control Cable
15. Cowl Ventilator Damper Control Cable
16. Cowl Ventilator Damper Control Knob
17. Weather Eye Control Knob and Switch

FIGURE 2—*Nash Weather Eye System "Rambler" Series.*



FIGURE 3—*Cowl Ventilator Damper Control Knob (Knob "IN", Damper in Closed Position) "Ambassador" and "Statesman" Series.*

When the control knob is in the forward position on the "Ambassador" and "Statesman" Series, the cowl ventilator damper is closed shutting out fresh air, and when the control knob is in the full "OUT" position, the cowl ventilator damper is open allowing fresh air to be filtered into the car. This procedure is reversed in the "Rambler" Series as the damper control arm is in an opposite position.

WINTER DRIVING

The Weather Eye is part of the engine cooling system and depends on normal engine operating temperature and air flow through the cowl ventilator to heat the interior of the car.

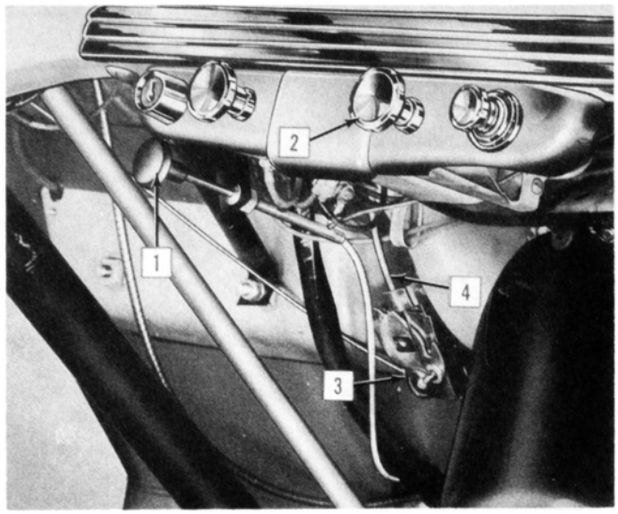
NOTE: *For most efficient operation in extreme cold weather, a 180° thermostat is recommended when using a permanent type of anti-freeze.*

With the cowl ventilator and the water control valve open, fresh air enters the cowl ventilator and is filtered and heated as it passes through the heater core and circulated within the car at average driving speeds. Added heat can be obtained in the rear passenger compartment by opening the rear quarter ventilators slightly.

While driving in slow traffic with the water control valve fully open, a heater fan located directly behind the heater core may be utilized to circulate fresh filtered air.

DEFROSTING

Windshield defrosting is accomplished by the combination heater and defroster fan located directly behind the heater core.



1. Cowl Ventilator Damper Control Knob (Knob "OUT," Damper in Closed Position)
2. Heater Switch and Water Valve Control
3. Water Control Valve
4. Water Control Cable and Conduit

FIGURE 4—*Weather Eye Controls. "Rambler" Series*

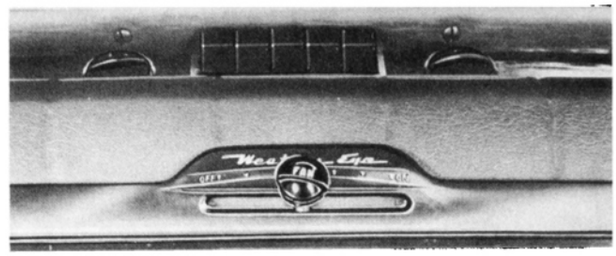
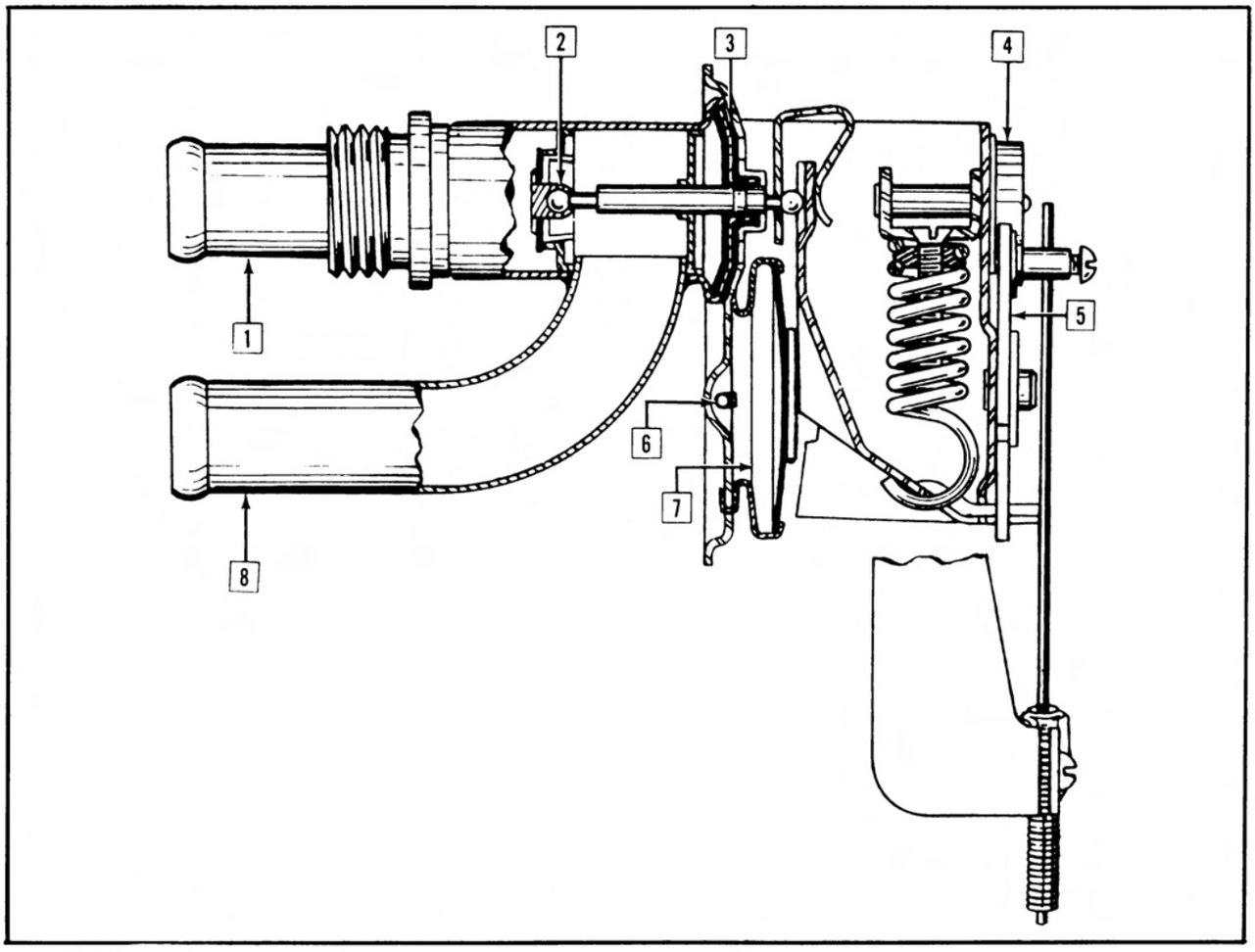


FIGURE 5—*Heater Switch and Water Valve Control "Ambassador" and "Statesman" Series.*

The fresh air is rammed in through the open cowl ventilator while the car is in motion or drawn in at idle or slow speed by the combination heater and defroster fan and deflected to the defroster ducts; in turn forced through the air openings at the bottom of the windshield onto the glass. In de-icing where warm air is required, it is necessary to open the water control valve to allow warm water from the engine to pass into the heater core so that warm air is forced to the windshield.



1. Valve Outlet Tube to Upper Heater Core Tube
2. Water Valve and Metering Guide
3. Water Seal
4. Manual Control Roller
5. Operating Cam
6. Capillary Tube
7. Bellows
8. Water Inlet Tube from Cylinder Head

FIGURE 6—*Water Control Valve.*

WEATHER EYE WATER VALVE CONTROL AND SWITCH

The Weather Eye control switch is a combination electric rheostat switch and water valve control. The "Ambassador" and "Statesman" Series control switch is illustrated in Figure 5. The "Rambler" Series is illustrated in Figure 4.

To open the water control valve on the "Ambassador" and "Statesman" Series, the valve control and switch knob is moved horizontally from the left the "OFF" position, to the right the "ON" position. To open the water control valve on the "Rambler" Series, the control switch is pulled "OUT"; to close, it is pushed "IN." In both cases, moving the control valves to the full open position allows the full flow of water to pass through the heater core.

When the Weather Eye switch is turned to the first position to the right (clockwise) from the "OFF" position, the combination heater and defroster motor operates at high speed. The speed is decreased as the switch is turned gradually to the right.

WATER CONTROL VALVE

The water control valve is operated manually and automatically which in turn controls the amount of coolant passing through the heater core. The thermostat incorporated in the valve has a flexible capillary control tube leading from a small gas filled chamber and bellows to a position directly behind the heater core (Figs. 16 and 17).

Automatic Control

With the water control valve locked in the complete "ON" position or locked in the full "OFF" position, the automatic feature will not operate.



FIGURE 7—*Removal of Heater Core Cover ("Statesman" Series Shown).*

Intermediate positions of the control knob will govern the automatic control. The temperature of the air surrounding the capillary tube controls the volume of water flow through the heater core by thermostatic action. Passenger comfort will determine the correct control knob position. Depending on the position of the control knob, inside temperature is maintained at a desired level.

COWL VENTILATOR DAMPER ADJUSTMENT

"Ambassador" and "Statesman" Series

To adjust the cowl ventilator damper control cable, push the control knob into the "OFF" position and locate the control arm of the damper to the upper most or "CLOSED" position. Then retract the cable 1/8" to allow for cable movement in the conduit. Clamp the cable securely.

"Rambler" Series

Push the control knob into the full "OPEN" position. Locate the damper control arm to the upper most or "OPEN" position. Retract the cable 1/8" to allow for cable movement in the conduit. Clamp the cable securely.

AIR FILTER

Removal

To service the Weather Eye on the "Statesman" and "Rambler" Series, the carburetor air cleaner must be removed.

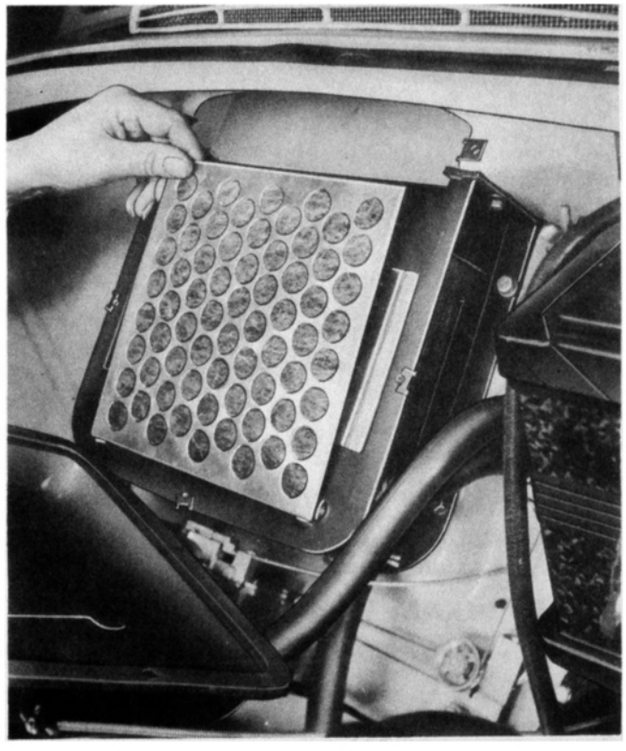


FIGURE 8—*Removing the Air Filter ("Rambler" Series).*

Disconnect the cowl ventilator damper cable from damper arm.

Remove heater core cover attaching screws, move cover forward, and lift out the air filter.

NOTE: *Change the air filter every spring and fall. Change more frequently if considerable driving is done under dusty conditions.*

Installation

To replace the air filter in the "Ambassador" and "Statesman" Series, locate the filter in position against the hold down springs in the heater core cover (Fig. 9) and slide the assembly into place

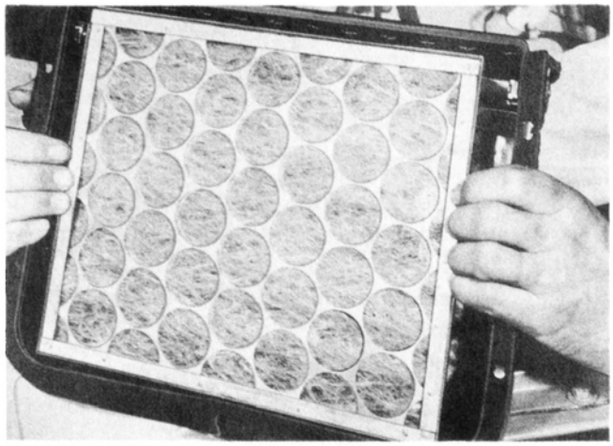


FIGURE 9—*Replacing Air Filter "Ambassador" and "Statesman" Series.*

under the cowl panel (Fig. 10). The air filter must be seated in the locating flanges in the lower section of the heater core shell. Then replace the cover mounting screws.

Connect and adjust the control cable as outlined in Cowl Ventilator Damper Adjustment.

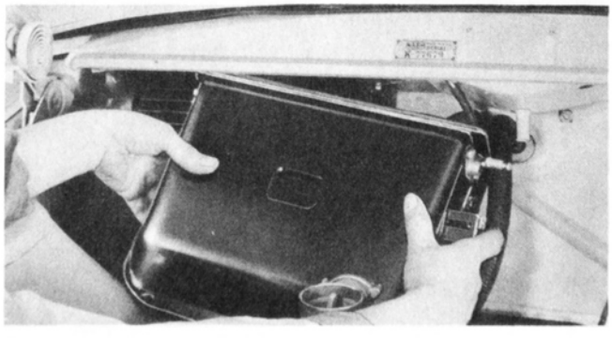


FIGURE 10—*Installing Filter and Cover ("Statesman" Series Shown).*

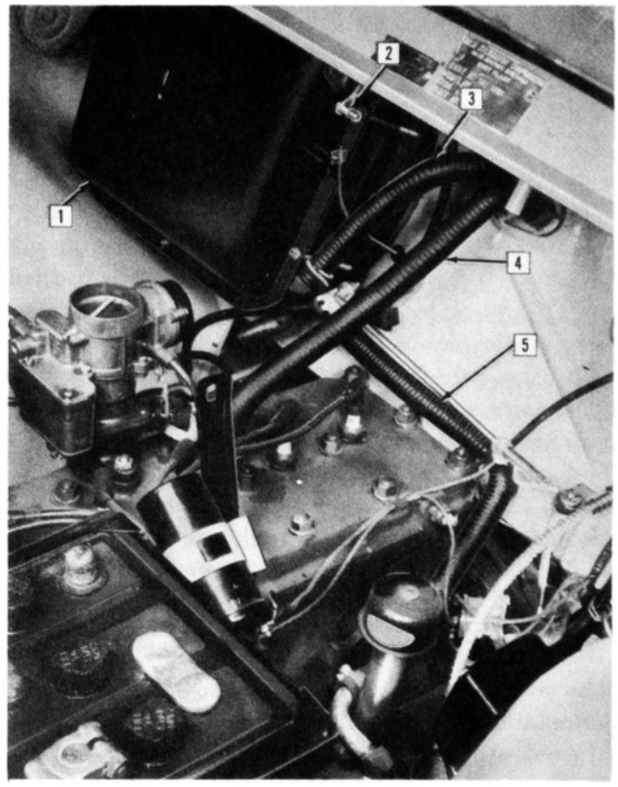
HEATER CORE REMOVAL

Open the water control valve to the full "OPEN" postion.

Drain at least a quart and a half of water from the cooling system to allow the water to drain from the heater core.

Disconnect the cowl ventilator damper control cable and conduit.

Disconnect the heater hoses from the heater core (Fig. 11).

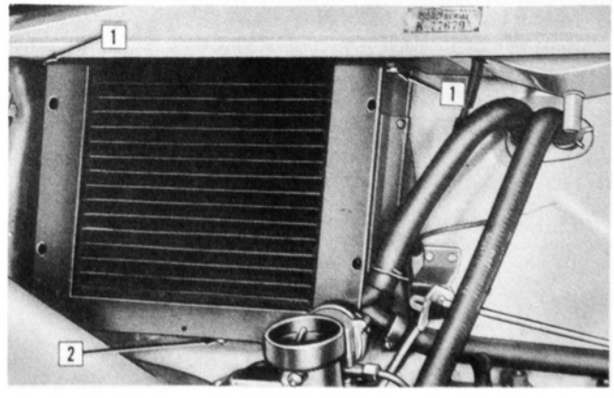


1. Heater Core Cover
2. Ventilator Control Cable
3. Water Control Valve to Heater Core Hose
4. Cylinder Head to Water Control Valve Hose
5. Heater Core to Water Pump Hose

FIGURE 11—*Weather Eye Hose and Control Cable Locations "Statesman" Series Shown.*

Remove heater core cover screws, cover, and air filter.

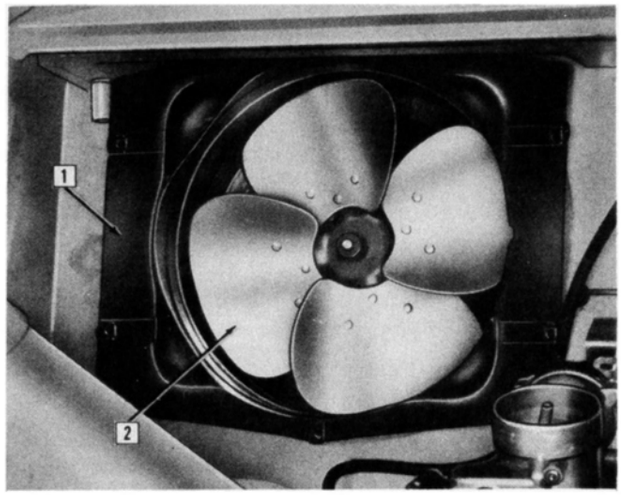
Remove the heater core attaching screws, and remove the heater core from its mounting location (Fig. 12).



1. Core to Cowl Panel Screw Locations
2. Core to Dash Panel Screw Location

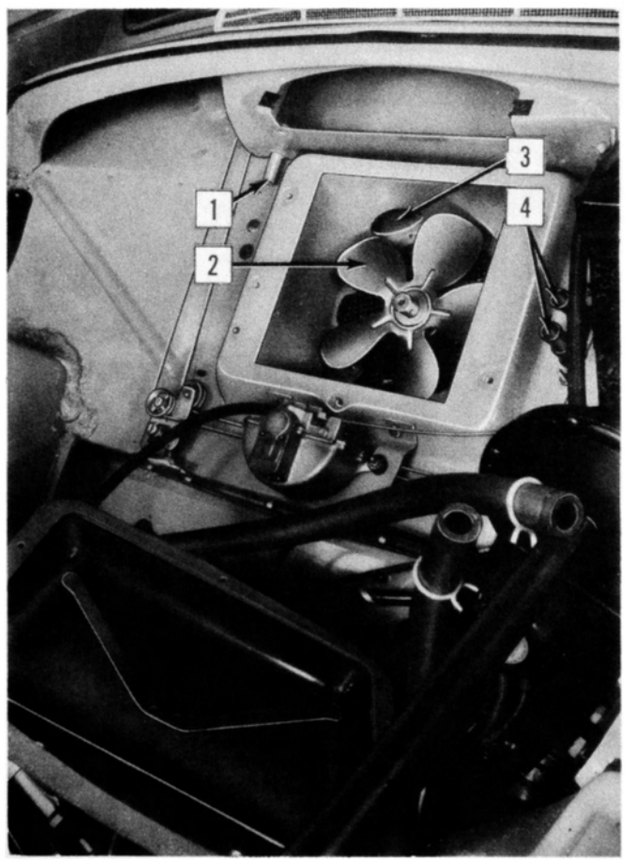
FIGURE 12—*Heater Core Attaching Screw Locations "Ambassador" and "Statesman" Series Shown.*

To facilitate the removal of the heater core on the "Ambassador" and "Statesman" Series, remove the right heater to cowl panel attaching screw and loosen the left screw (Item 1, Fig. 12). The hole is slotted to allow sliding the heater core to the right after the heater core to dash mounting screw has been removed. The heater core cannot be removed directly out from its position because of interference with the inner wheelhouse panel and the flange on the cowl panel. It must be slid out by moving it to the right and forward.



1. Heater Fan Spacer
2. Heater and Defroster Fan

FIGURE 13—*Heater Core Removed "Ambassador" and "Statesman" Series.*



1. Cowl Ventilator Hood Drain
2. Heater and Defroster Fan
3. Defroster Air Duct
4. Water Control Valve

FIGURE 14—*Heater Core Removed "Rambler" Series.*

HEATER AND DEFROSTER MOTOR REMOVAL

Remove the heater shroud from inside the passenger compartment (Fig. 15).

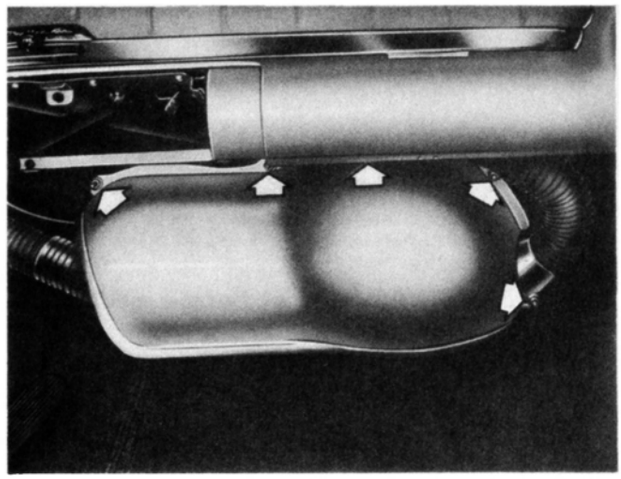
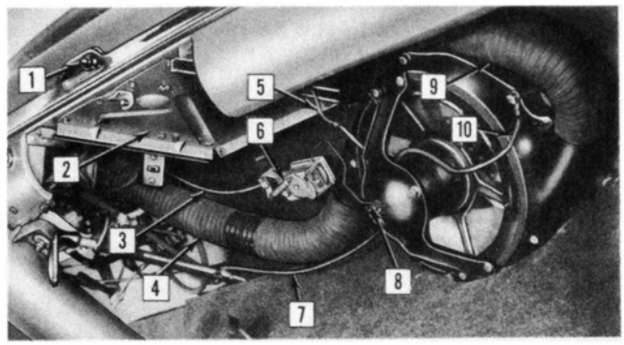


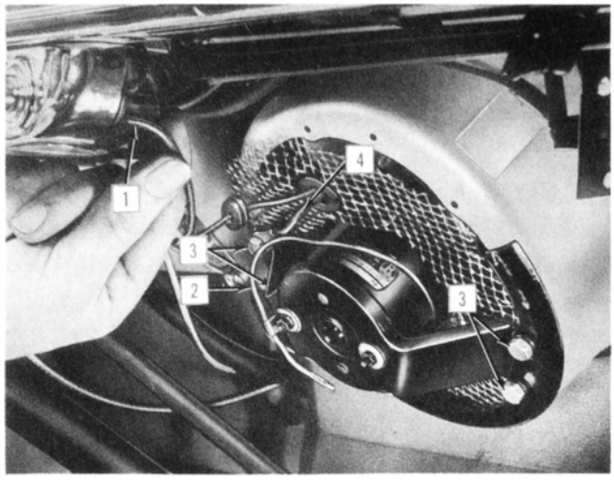
FIGURE 15—*Heater Shroud Attaching Stud Locations "Ambassador" and "Statesman" Series Shown.*



1. Water Valve Control and Heater Defroster Switch
2. Glove Box Mounting Panel
3. Water Valve Control Cable and Conduit
4. Left Defroster Hose
5. Heater and Defroster Motor Wire
6. Water Control Valve
7. Cowl Ventilator Damper Control Cable and Conduit
8. Water Valve Capillary Tube
9. Right Defroster Hose
10. Heater and Defroster Motor Ground Wire Attached With Mounting Screw

FIGURE 16—*Heater and Defroster Motor Location, Connections, and Mounting (Inside Car) "Ambassador" and "Statesman" Series.*

Disconnect the heater motor wire from the control switch and the capillary tube from the motor support.



1. Heater and Defroster Motor Wire
2. Water Valve Capillary Tube
3. Heater Motor Mounting Screws
4. Heater and Defroster Motor Ground Wire Attached With Mounting Screw

FIGURE 17—*Heater and Defroster Motor Connections and Mountings "Rambler" Series.*

Remove the left and right defroster hoses on the "Ambassador" and "Statesman" Series. The "Rambler" Series defroster ducts are built in the heater fan housing assembly and dash panel.

"Ambassador" and "Statesman" Series

The heater and defroster fan housing and motor assembly can be removed as an assembly by removing the mounting bolts (Fig. 18).

To further disassemble the heater and defroster fan housing assembly, remove the fan blades from the motor (Fig. 19).

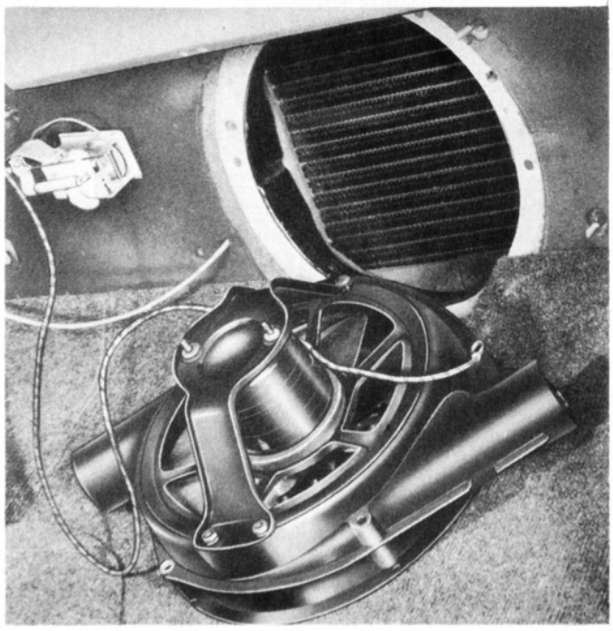


FIGURE 18—*Heater and Defroster Fan Housing Assembly Removed "Ambassador" and "Statesman" Series.*

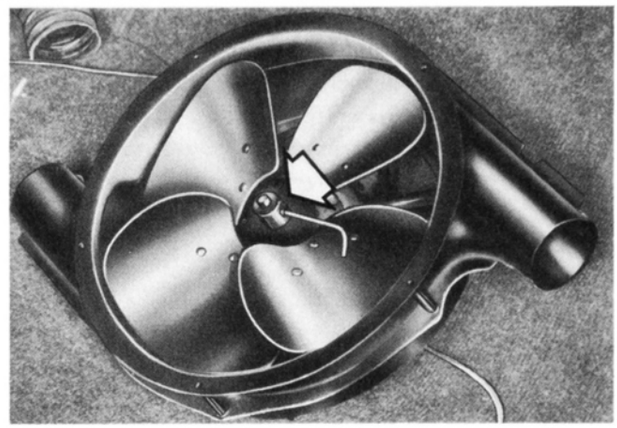


FIGURE 19—*Heater and Defroster Fan Removal "Ambassador" and "Statesman" Series.*

Remove the heater motor, support, and fan guard from the heater fan housing (Fig. 20).

Remove the heater motor support. Apply brake fluid to the heater motor rubber insulator to aid in removal. Use an "Ambassador" Series pinion shaft companion flange and bearing puller

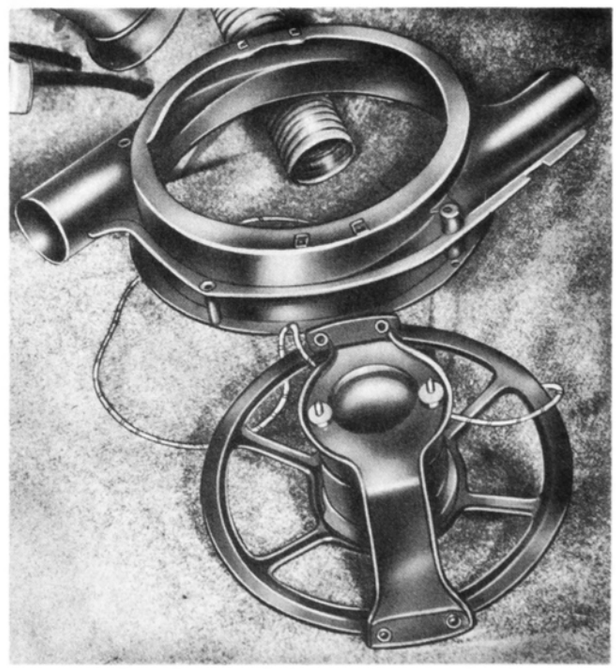
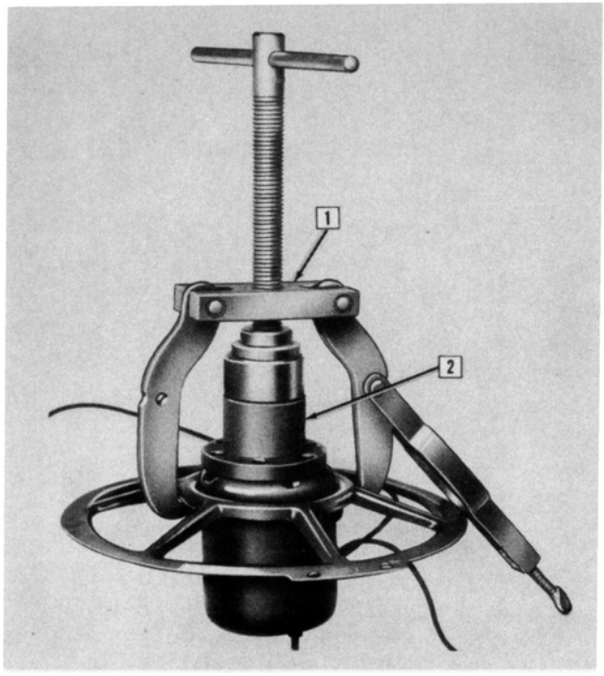


FIGURE 20—*Heater and Defroster Motor Assembly Removed From the Heater Fan Housing "Ambassador" and "Statesman" Series.*

J-2497-A to remove the motor from the fan guard (Fig. 21).

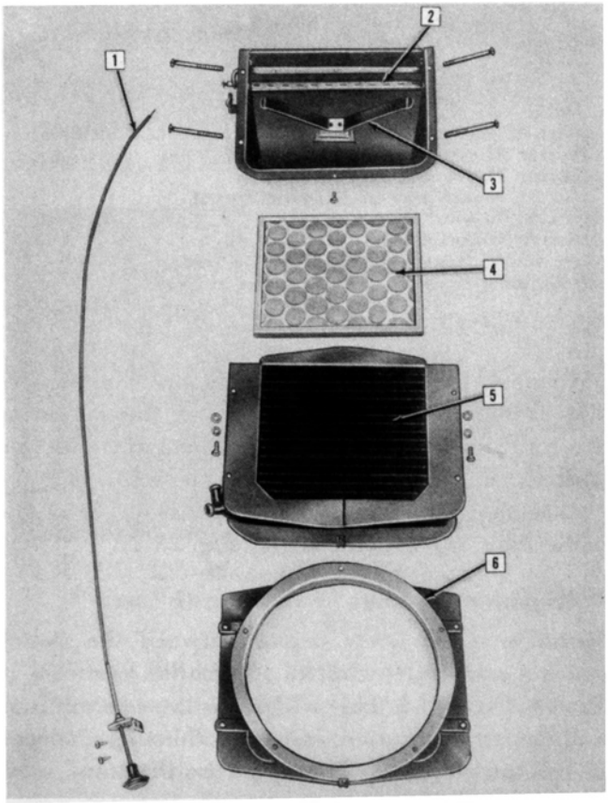
"Rambler" Series

The "Rambler" Series heater and defroster motor and fan is now removed as an assembly by removing the mounting screws (Item 3, Figure 17).



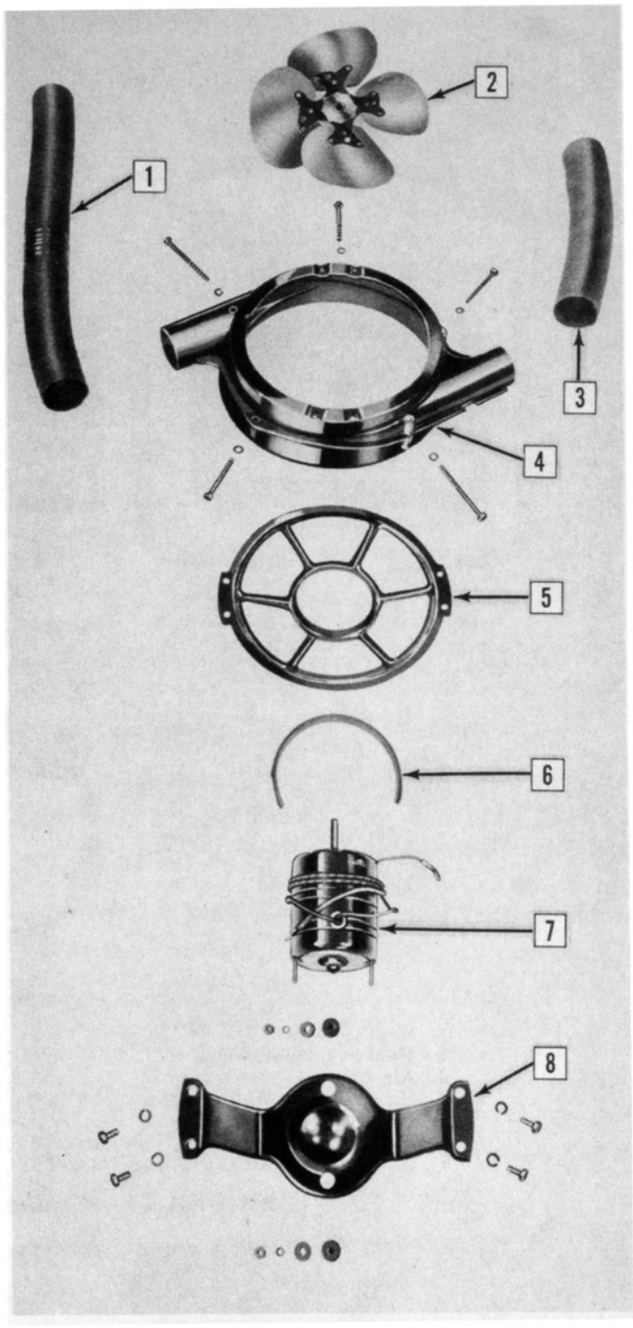
1. "Ambassador" Series Pinion Shaft Companion Flange
2. J-2497-A Differential Side Bearing Puller

FIGURE 21—*Removing the Heater Motor From the Fan Guard "Ambassador" and "Statesman" Series.*



1. Cowl Ventilator Damper Control Cable and Conduit
2. Cowl Ventilator Damper
3. Heater Core Cover
4. Air Filter
5. Heater Core
6. Heater Fan Spacer

FIGURE 22—*Weather Eye Core Assembly "Ambassador" and "Statesman" Series.*



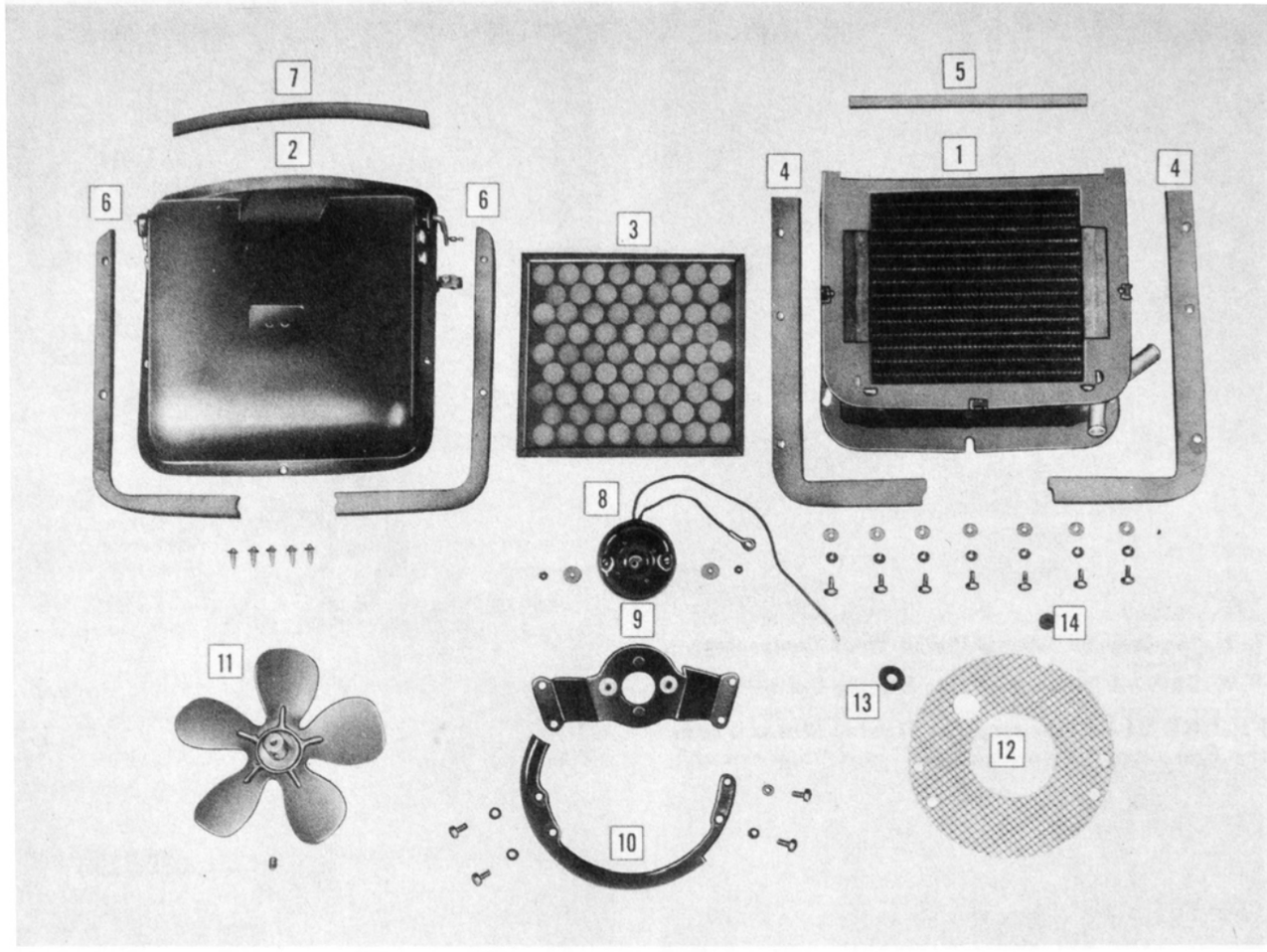
1. Left Defroster Hose
2. Heater and Defroster Fan
3. Right Defroster Hose
4. Heater and Defroster Fan Housing Assembly
5. Fan Guard
6. Heater and Defroster Motor Rubber Insulator
7. Heater and Defroster Motor
8. Heater and Defroster Motor Support

FIGURE 23—*Heater and Defroster Fan Assembly "Ambassador" and "Statesman Series.*

REMOVAL OF WATER VALVE CONTROL AND SWITCH ASSEMBLY

"Ambassador" and "Statesman" Series

Remove the glove box and glove box mounting panel.



1. Heater Core
2. Heater Core Cover
3. Air Filter
4. Heater Core, Side Gasket
5. Heater Core, Top
6. Heater Cover to Core, Side Gasket
7. Heater Cover to Core, Top Gasket
8. Heater Motor
9. Heater Motor Support
10. Heater Motor Screen Reinforcement
11. Heater Motor Fan
12. Heater Motor Screen
13. Grommet, Heater Motor Wire in Screen
14. Grommet, Heater Motor Wire in Shroud

FIGURE 24—*Weather Eye "Rambler" Series.*

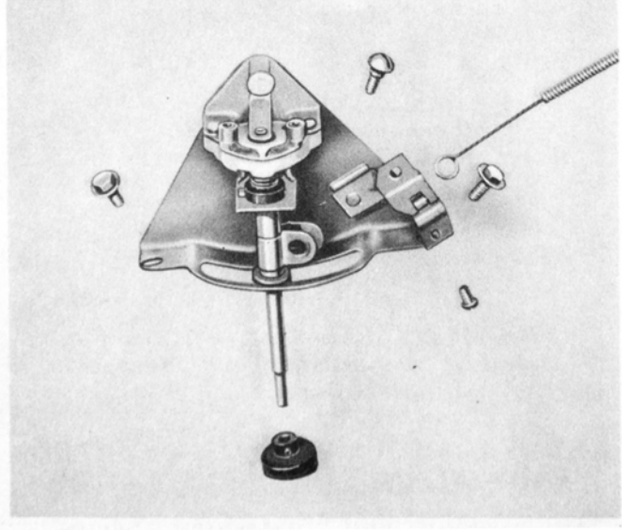


FIGURE 25—*Water Valve Control and Switch Assembly "Ambassador" and "Statesman" Series.*

Remove the heater control knob. Then remove the switch assembly by removing the mounting screws from the rear of the instrument panel and pulling the assembly out of the panel.

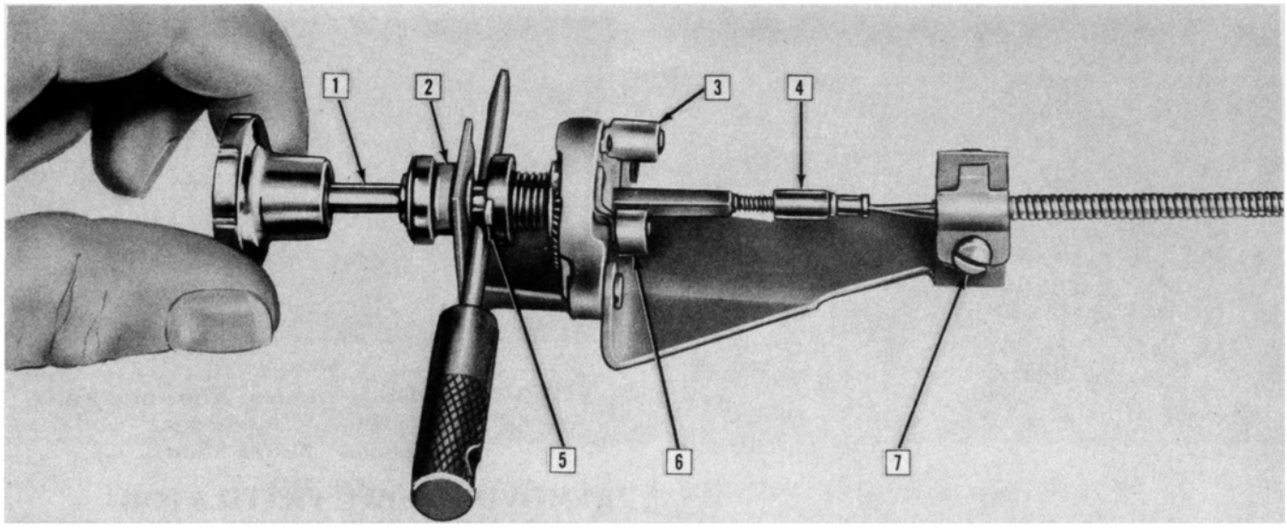
Disconnect the wires from the switch and the cable from the control shaft (Fig. 25).

"Rambler" Series

Insert a small screw driver between the switch bracket and switch control stop collar as shown in Item 4, Figure 26. This will allow the control knob and shaft to be unscrewed from the threaded end of the control cable. Then pull the shaft and knob straight out.

The switch can be withdrawn from the instrument panel after the French mounting nut has been removed.

Disconnect the switch wires from the connectors and the cable conduit from the clamp (Fig. 26).



1. Control Switch Shaft and Knob Sweated Together
2. French Mounting Nut
3. Electric Feed Wire From Ignition Switch Terminal
4. Control Cable Threaded End
5. Switch Control Stop Collar
6. Heater Motor Wire Terminal
7. Control Cable Conduit Clamp

FIGURE 26—*Water Valve Control and Switch Assembly "Rambler" Series.*

NOTE: *Upon installation, the control knob and shaft must be screwed completely into the threaded end of the cable, then backed off two full turns to allow free operation of the heater switch.*

WATER CONTROL VALVE REMOVAL

Disconnect the heater hoses from the water control valve (Fig. 27).

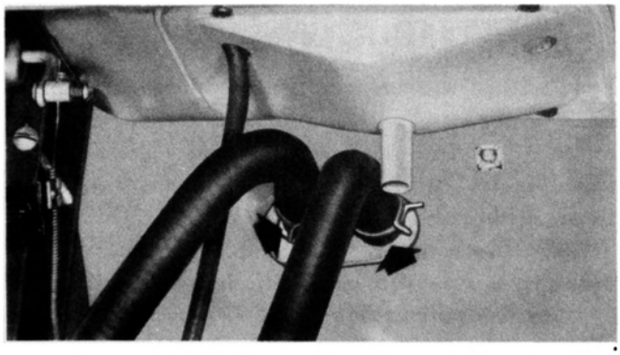


FIGURE 27—*Hose Connections at the Water Valve "Ambassador" and "Statesman" Series Shown.*

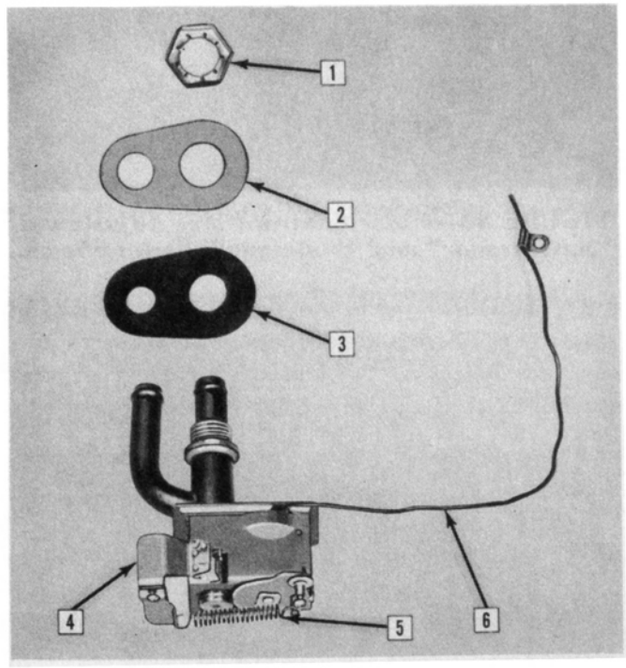
Remove the heater shroud.

Disconnect the capillary tube from the motor mounting and the control cable and conduit from the valve. Then remove the water control valve from the dash panel.

WATER CONTROL VALVE ADJUSTMENT

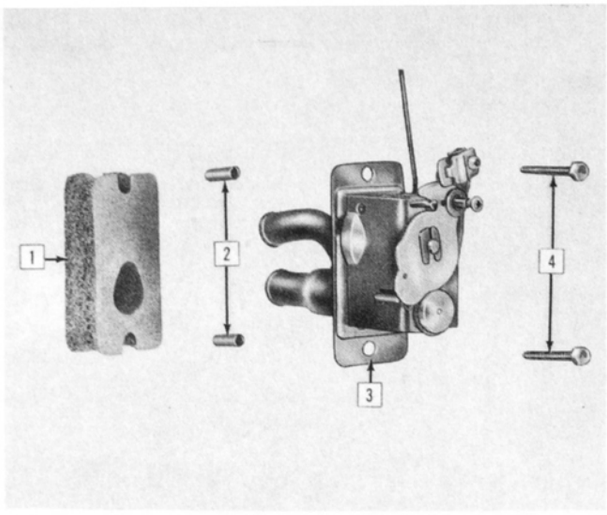
The water control valve cable adjustment is of extreme importance.

To correctly adjust the water control valve cable, the control knob on the dash must be in the "OFF" position and the water control valve cam must be in the "CLOSED" position (Figs. 30 and 31) prior to retightening the cable securely in the clamp.



1. Water Control Valve Mounting Nut
2. Water Control Valve Mounting Spacer
3. Water Control Valve to Dash Sealer Gasket
4. Water Control Valve
5. Equalizer Spring
6. Capillary Tube

FIGURE 28—*Water Control Valve Assembly "Ambassador" and "Statesman" Series.*



1. Water Control to Dash Sealer Gasket
2. Water Control Valve Mounting Spacer
3. Water Control Valve
4. Water Control Valve Mounting Screws

FIGURE 29—*Water Control Valve Assembly "Rambler" Series.*

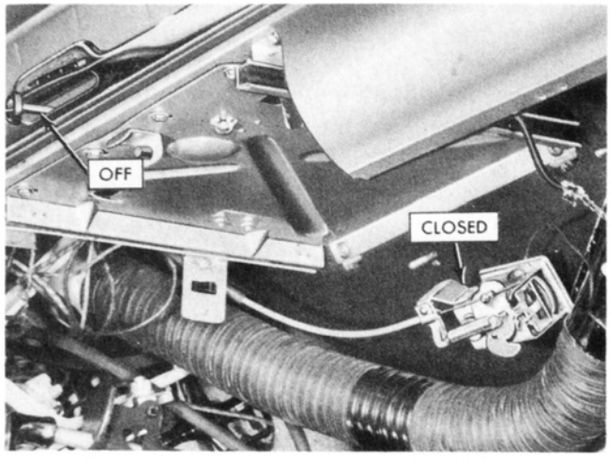


FIGURE 30—*Water Control Valve Adjustment "Ambassador" and "Statesman" Series Shown.*

The equalizer spring on the "Ambassador" and "Statesman" Series water control valve serves as a counterbalance for the bellows spring to prevent movement of the valve without control operation.

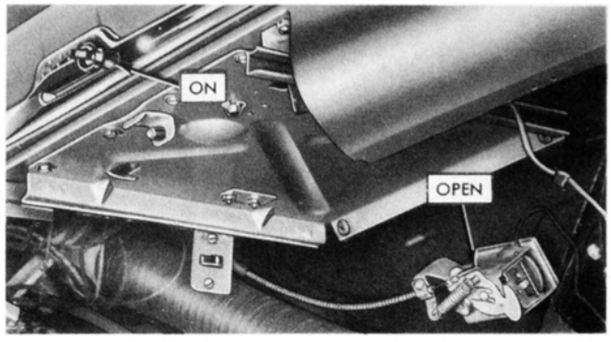


FIGURE 31—*Water Control Knob and Valve "OPEN" Position "Ambassador" and "Statesman" Series Shown.*

REMOVING COWL VENTILATOR INTAKE COVER PANEL AND SCREEN ASSEMBLY

"Ambassador" and "Statesman" Series

Remove the windshield wiper arms and blades, shaft nuts, spacers, and gaskets.

The cowl ventilator intake cover panel is held in place by three plunger type pins into rubber grommets. It can be removed by prying upward with a wooden stick at three points as shown in Figure 32.

"Rambler" Series

To remove the cowl ventilator hood and screen assembly, raise the hood of the car and remove the attaching screws from below the cowl panel.

SPEEDOMETERS

The speedometers used on all series are of the magnetic type. For servicing of the speedometer head within warranty, it is recommended that the head be replaced with a unit from stock. For maintenance service after the warranty period, the speedometer head should be removed and taken to an authorized service station.

Lubrication of the needle shaft bearing is provided by a reservoir and wick located at the rear of the speedometer head.

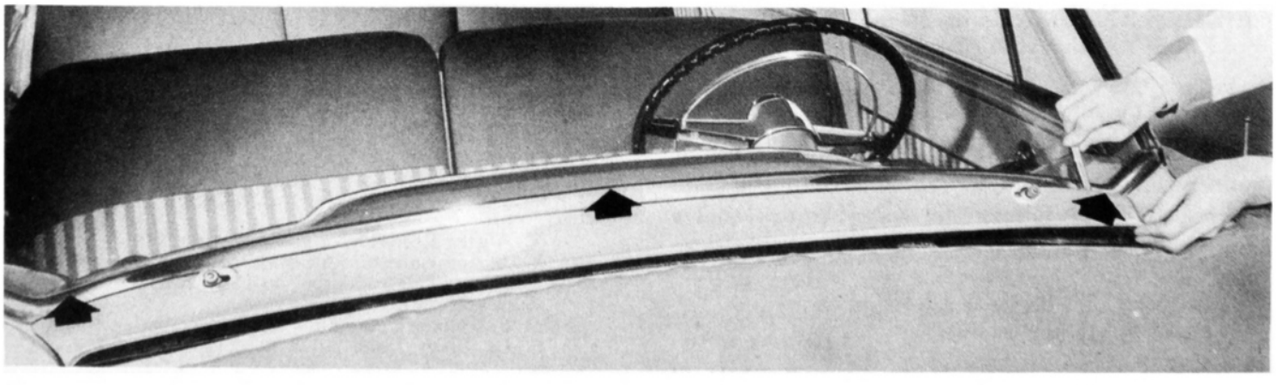


FIGURE 32—*Cowl Ventilator Intake Cover Panel "Ambassador" and "Statesman" Series.*

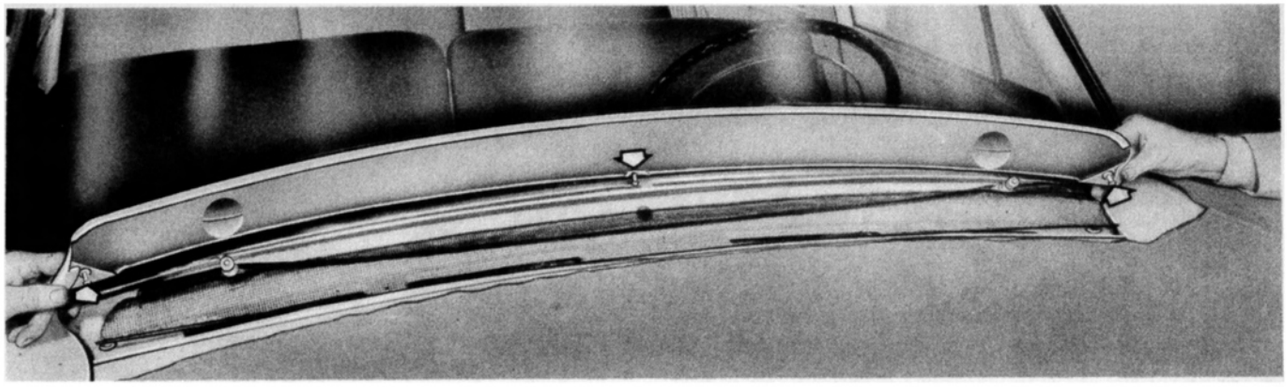


FIGURE 33—*Cowl Ventilator Intake Cover Panel Removed "Ambassador" and "Statesman" Series.*

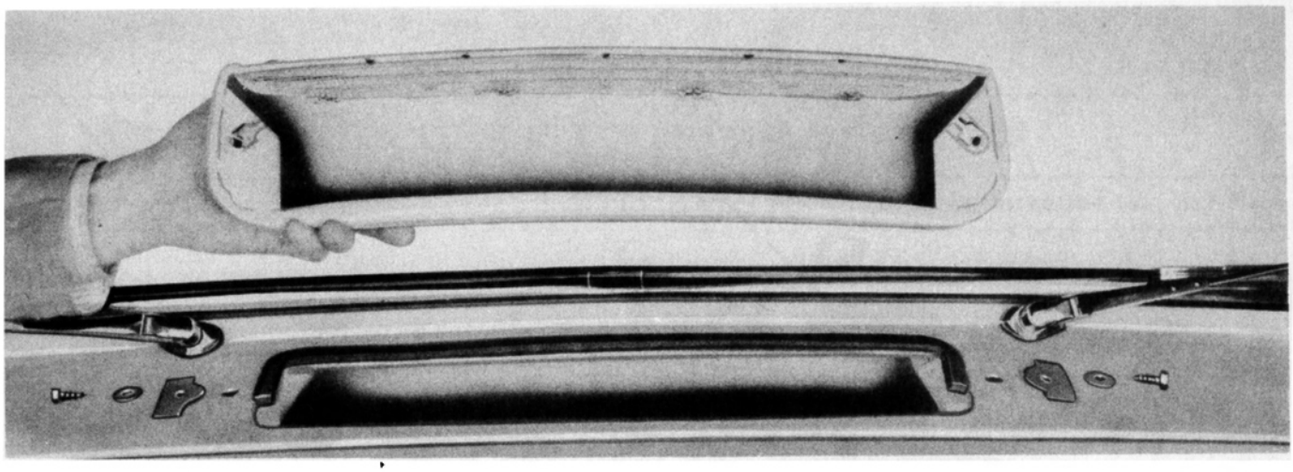


FIGURE 34—*Cowl Ventilator Hood and Screen Assembly Removed "Rambler" Series.*

REMOVING THE SPEEDOMETER

"Ambassador" and "Statesman" Series

Remove the battery ground strap from the battery as a precautionary measure; it eliminates the possibility of a short.

Disconnect the speedometer cable from the speedometer.

Remove the speedometer and housing assembly from the rear of the instrument panel. The speedometer head can then be removed.

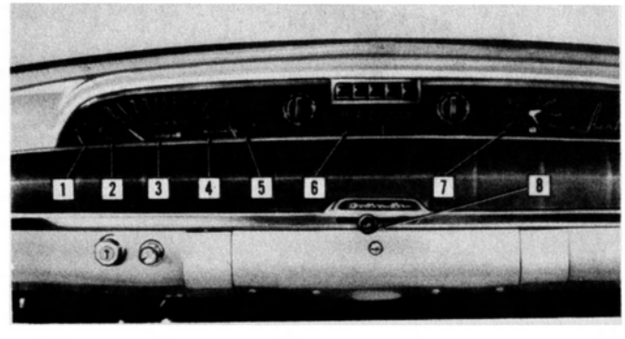
"Rambler" Series

Disconnect the wiring and speedometer cable from the rear of the instrument cluster assembly. Then remove the three "L" shaped brackets retaining the cluster assembly to the rear of the instrument panel.

The speedometer head can then be removed from the instrument cluster assembly by unfastening the lens bezel and removing the lens and two retaining screws.

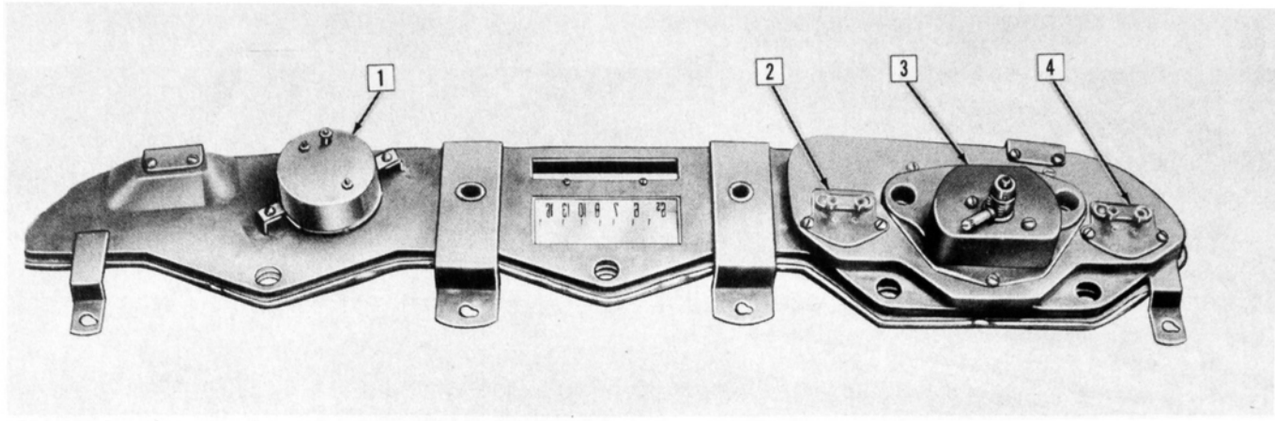
SPEEDOMETER CABLE INSPECTION

Always inspect the speedometer cable housing, whenever working on the speedometer, for kinks



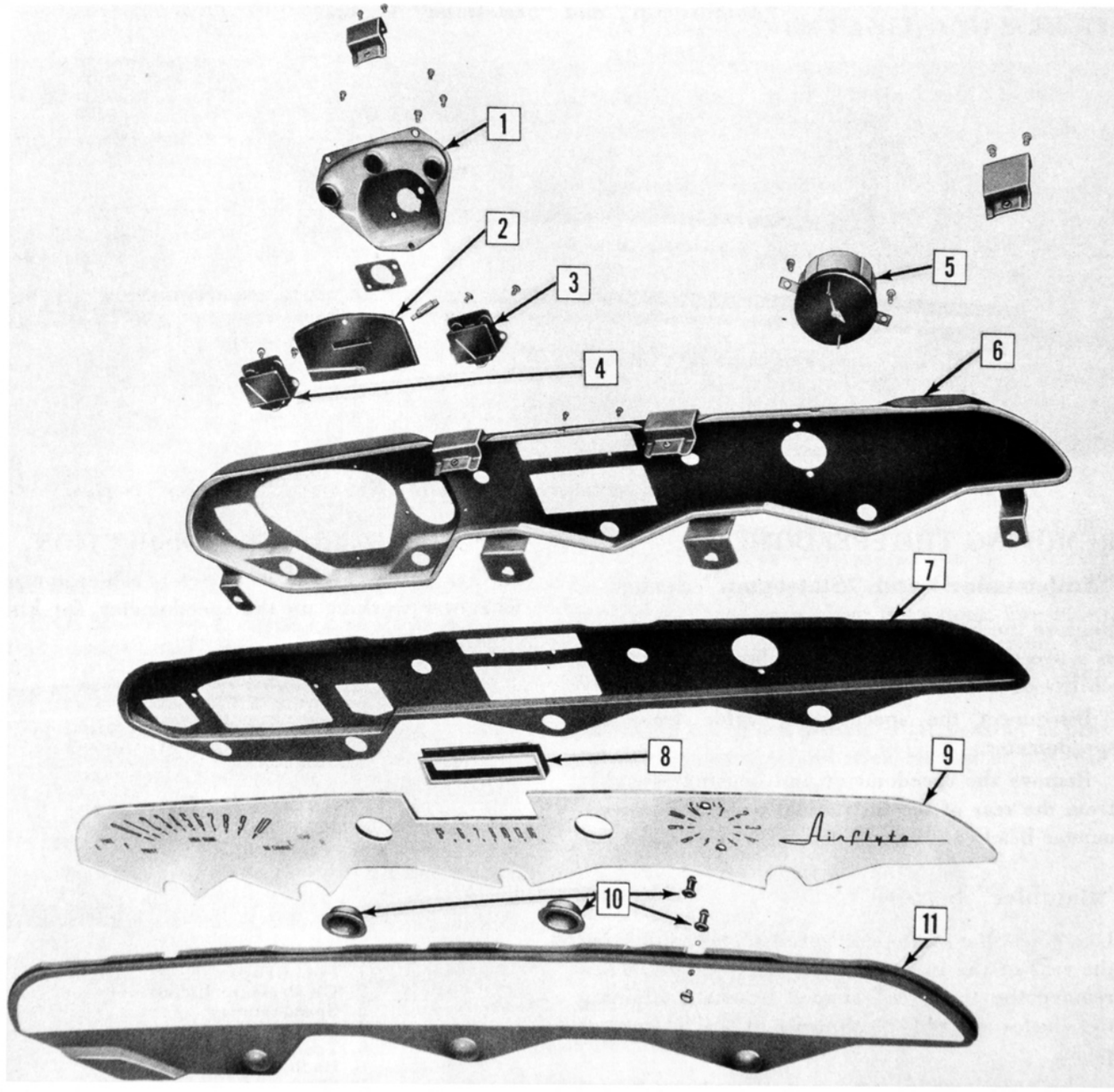
1. Fuel Gauge
2. Oil Pressure Indicator
3. Speedometer
4. No-Charge Indicator
5. Temperature Gauge
6. Radio
7. Clock
8. Weather Eye Control

FIGURE 35—*Instrument Panel Assembly "Ambassador" and "Statesman" Series.*



1. Clock 2. Water Temperature Gauge 3. Speedometer 4. Fuel Level Indicator

FIGURE 36—*Gauge Mounting Locations "Ambassador" and "Statesman" Series.*



1. Speedometer Head Housing
2. Speedometer Head
3. Temperature Gauge
4. Fuel Gauge
5. Clock
6. Cluster Housing
7. Lens Locking Plate
8. Radio Push Button Bezel
9. Lens
10. Lens Retaining Eyelets
11. Lens Retainer

FIGURE 37—*Exploded View of Instrument Cluster "Ambassador" and "Statesman" Series Shown.*

or sharp bends in the housing. Make sure that the cable is of the correct length for the series required.

To insure the use of speedometer cable cores which will give quiet and satisfactory service, locate the cable core on a flat surface in the form of an inverted "U" and then cross the open ends. Hold one end in the left hand, the other in the right hand.

Twist one end, applying light finger pressure to the other end. If the core is satisfactory, the turning action will be smooth.

On a damaged core, although not noticeable by visual inspection, the turning action will be jerky and, in a severe case, will leap or jump.

The speedometer cable requires no lubrication but as a sound deadener, it is beneficial to coat the cable with a light coating of high melting point grease.

The end play of the speedometer needle shaft bearing should also be inspected. This should not exceed a maximum of .005" on the "Ambassador" and "Statesman" Series. Maximum end play not to exceed .008" to .014" on the "Rambler" Series.

FUEL AND TEMPERATURE GAUGE REMOVAL

To remove one or all of the gauges from the instrument panel, disconnect and tag the wires. Then remove the mounting screws.

NOTE: *For test procedure, refer to the Electrical Section—Testing Fuel Level and Temperature Indicators.*

TECHNICAL SERVICE LETTER REFERENCE

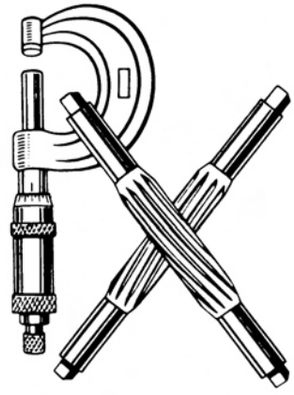
Date	Letter No.	Subject	Changes information on Page No.

TECHNICAL SERVICE LETTER REFERENCE

Date	Letter No.	Subject	Changes information on Page No.

Nash

TECHNICAL SERVICE MANUAL

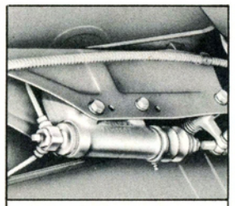


LUBRICATION SECTION

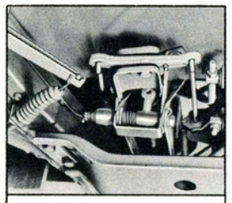
LUBRICATION CHART

LUBRICATION

Nash LUBRICATION

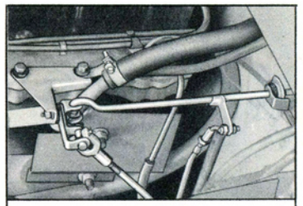


MASTER CYLINDER
1,000 MILES CHECK. FILLER UNDER FLOOR "AMBASSADOR" AND "STATESMAN" SERIES. UNDER HOOD "RAMBLER" SERIES, LOCKHEED "21" FLUID

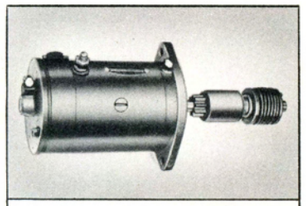


CLUTCH BEAM
1,000 MILES
1 OILER
CHASSIS LUB.

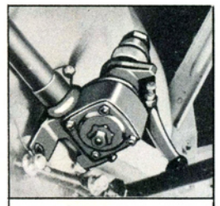
PEDAL SHAFT
1,000 MILES
1 OILER
CHASSIS LUB.



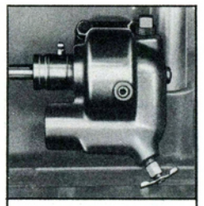
THROTTLE LINKAGE AND THROTTLE SHAFT BEARING FELT WICK
1,000 MILES LIGHT ENGINE OIL



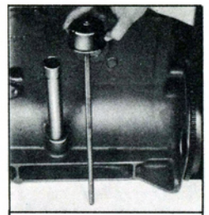
STARTER
5,000 MILES. "AMBASSADOR" SERIES 2 OIL CUPS. "STATESMAN" AND "RAMBLER" SERIES 1 OIL CUP. LIGHT ENGINE OIL.



STEERING GEAR
3,000 MILES. ONE PLUG—SEE NOTE.



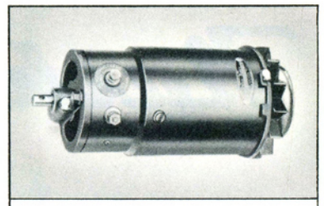
WATER PUMP
5,000 MILES. 1 OILER—SEE NOTE.



ENGINE OIL FILLER AND GAUGE
CHECK DAILY. SEE NOTE.

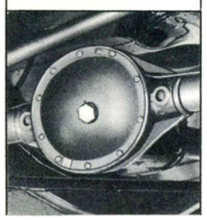


AIR CLEANER
2,000 MILES, CLEAN AND REOIL. OIL BATH TYPE (ABOVE) FOLLOW LABEL.

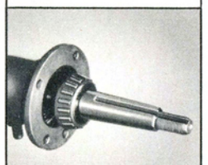


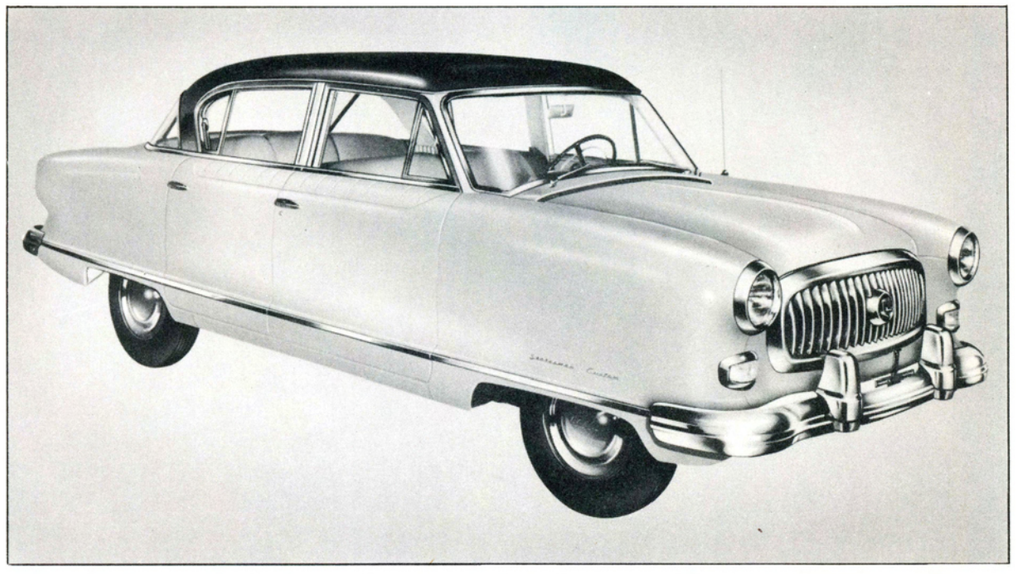
GENERATOR
5,000 MILES, 2 OIL CUPS LIGHT ENGINE OIL.

REAR AXLE DRIVE GEARS
1,000 MILES, CHECK—SEE NOTE.



AXLE SHAFT BEARINGS
15,000 MILES. REPACK, WHEEL BEARING LUBRICANT.



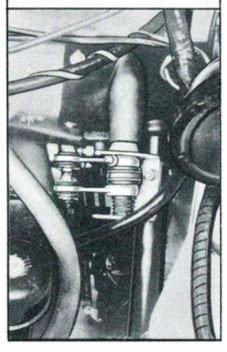


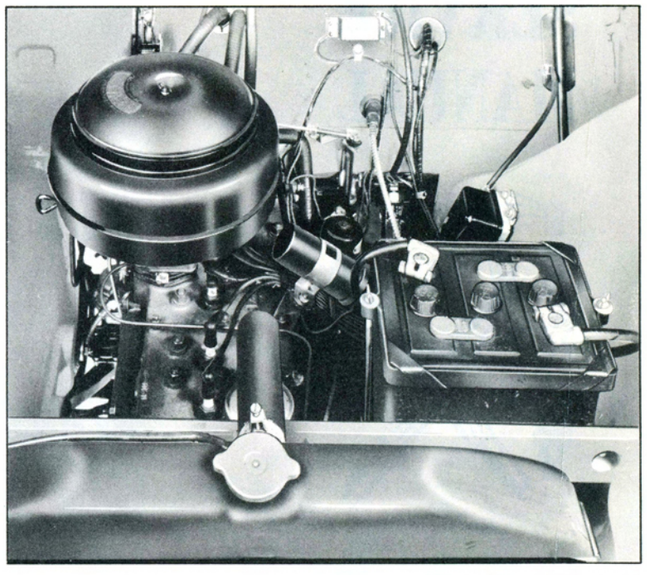
FRONT SUSPENSION
1,000 MILES, "AMBASSADOR" AND "STATESMAN" SERIES 9 OILERS. "RAMBLER" SERIES 11 OILERS CHASSIS LUBRICANT.



BATTERY TEST
1,000 MILES
CHECK WATER—DO NOT OVERFILL.

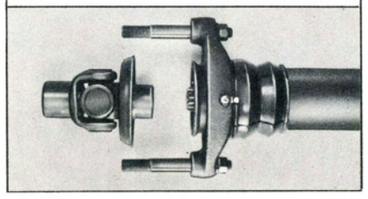
GEAR SHIFT LEVER
5,000 MILES, 1 OILER
CHASSIS LUBRICANT.



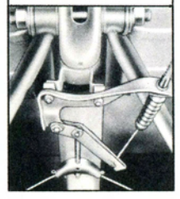


UNIVERSAL JOINTS
15,000 MILES. INSPECT, REPACK CHASSIS LUBRICANT.

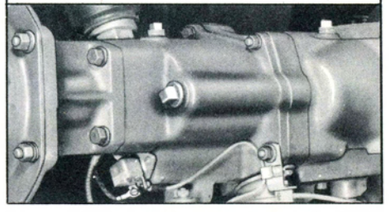
TORQUE TUBE TRUNNION
5,000 MILES
"STATESMAN" SERIES ONLY. 1 OILER, CHASSIS LUBRICANT.



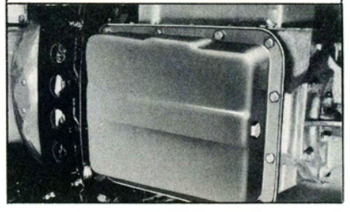
HAND BRAKE
BELL CRANK 1,000 MILES
LIGHT ENGINE OIL.



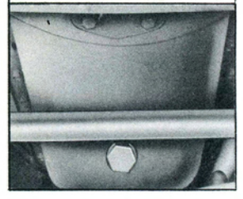
TRANSMISSION AND OVERDRIVE
1,000 MILES CHECK, 15,000 MILES DRAIN AND REFILL—SEE NOTE.



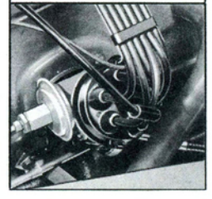
HYDRA-MATIC TRANSMISSION
1,000 MILES CHECK, 25,000 MILES DRAIN AND REFILL—SEE NOTE.



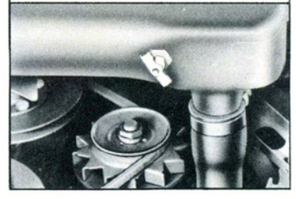
ENGINE OIL PAN
2,000 MILES DRAIN AND REFILL. "AMBASSADOR" SERIES SHOWN. "STATESMAN" AND "RAMBLER" SERIES LEFT SIDE—SEE NOTE.



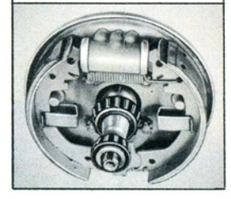
DISTRIBUTOR
"AMBASSADOR" SERIES (RIGHT). "STATESMAN" AND "RAMBLER" SERIES (LEFT)—SEE NOTE.



RADIATOR DRAIN
MAINTAIN WATER LEVEL AND EXPANSION SPACE. ADD INHIBITOR. DRAIN AND FLUSH BEFORE ADDING ANTI-FREEZE. "RAMBLER" SERIES WATER PUMP DRAIN ONLY.



FRONT WHEEL BEARINGS
10,000 MILES, REPACK WHEEL BEARING LUBRICANT.



LUBRICATION INFORMATION

NOTES:

ENGINE OIL

"AMBASSADOR" SERIES.....6 QTS. (5 B.I.)
"STATESMAN" SERIES.....5 QTS. (4.2 B.I.)
"RAMBLER" SERIES.....5 QTS. (4.2 B.I.)

ANTICIPATED MINIMUM TEMPERATURE
ABOVE +32°.....SAE 20 OR 20W
BELOW +32°.....SAE 10W
SUB-ZERO.....SAE 10W + 10% KEROSENE

B.I.—BRITISH IMPERIAL MEASUREMENTS

REAR AXLE OIL

"AMBASSADOR" SERIES.....4 PTS. (3.3 B.I.)
"STATESMAN" SERIES.....3 PTS. (2.5 B.I.)
"RAMBLER" SERIES.....3 PTS. (2.5 B.I.)

USE ONLY SAE 90 OIL SUITABLE FOR HYPOID GEARS. DRAIN, FLUSH, AND REFILL 10,000 MILES OR YEARLY.

TRANSMISSION OIL

"AMBASSADOR" SERIES REGULAR....2¼ PTS. (1.9 B.I.)
"AMBASSADOR" SERIES O.D.....3½ PTS. (3 B.I.)
"STATESMAN" SERIES REGULAR.....2¼ PTS. (1.9 B.I.)
"STATESMAN" SERIES O.D.....3½ PTS. (3 B.I.)
"RAMBLER" SERIES REGULAR.....1½ PTS. (1.25 B.I.)
"RAMBLER" SERIES O.D.....2¾ PTS. (2.3 B.I.)

USE SAE 90 MINERAL OIL IN WARM WEATHER AND SAE 80 IN COLD

MISCELLANEOUS LUBRICATION

STEERING GEAR.....SAE 90 STEERING GEAR LUBRICANT
WATER PUMP. WATER PUMP LUBRICANT
BRAKE CONTROLS.....USE OIL CAN

HYDRA-MATIC FLUID

"AMBASSADOR" SERIES 11 QTS. (9.2 B.I.)
"STATESMAN" SERIES 11 QTS. (9.2 B.I.)

ADDITIONAL MAINTENANCE DATA

DISTRIBUTOR LUBRICATION

WIPE BREAKER CAM WITH PETROLEUM JELLY—1,000 MILES. ONE DROP OF LIGHT ENGINE OIL ON BREAKER PIVOT AND BREAKER PLATE FELT WICK 5,000 MILES.

COOLING SYSTEM

"AMBASSADOR" SERIES.....18 QTS. (15 B.I.)
"STATESMAN" SERIES.....15 QTS. (12.5 B.I.)
"RAMBLER" SERIES.....12 QTS. (10 B.I.)

(INCLUDES 1 QT. FOR CARS EQUIPPED WITH WEATHER EYE.) PRESSURE CAP 7 LBS. PRESSURE. MAINTAIN EXPANSION SPACE.

TIRES

"AMBASSADOR" SERIES..24 LBS.
"STATESMAN" SERIES...24 LBS.
"RAMBLER" SERIES.....24 LBS.

CHECK PRESSURE WHEN TIRES ARE COLD.


SERVICE
Nash
PARTS